Future Issues and Their Impact on Recruitment of Civilians

Final Report

July 28, 1988

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This study was conducted to provide the Department of the Army with a methodology for improving the civilian manpower planning process by incorporating the impacts of current and future socio-economic, technological, demographic, and political trends. The final report provides a narrative list of these future trends which will affect the Army's work force skill requirements and the labor pool composition. The study suggests a method for developing decision support software which would help analysts answer "what if" questions.

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EXECUTIVE SUMMARY

This study was conducted to provide the Department of Army with a methodology for improving the civilian manpower planning process by incorporating the impacts of current and future socio-economic, technological, demographic, and political trends.

An essential component of the study was a thorough understanding of the Army's planning process. This was accomplished through a review of relevant documentation and interviews with Department of the Army personnel concerning data and forecasting efforts that would complement or enhance long range planning for civilians. Action items were identified that could improve the Army's ability to perform civilian planning functions.

The most basic item identified was the need for a clear definition of the role of civilians within the Army during peacetime and mobilization. This would enable the Army to specify a Civilian Objective Force (COF). The COF would quantitatively and qualitatively define the Army's future civilian labor demand by occupation. Subsequently, an Army Civilian Force Management Plan could be developed to recruit, train, and manage civilian employees to meet the COF occupational requirements.

For a Civilian Force Management Plan to be effective, it is necessary that Army planners have a notion about which of the COF specified occupations are likely to fall short of their desired staffing levels in light of Army civilian personnel policies and other relevant trends. To accomplish this task, we developed a methodology to identify 'shortfall occupations' based on matching the Army's demand to the national demand for labor. The methodology is the product of a literature review and interviews with individuals having expertise in the areas of forecasting national labor demand, education and job skill development, and relevant data sources.

We have determined that the Bureau of Labor Statistics (BLS) maintains the most complete and reliable source of national employment **projections** by occupation. BLS research indicates that the labor force will be growing more slowly than in recent years with most new jobs being skilled and in the service sector. Younger and older workers will be a smaller part of the labor force and there will be an increase in the proportion of minorities, females, and immigrants.

For the data on the national work force to be integrated with the Army's demand for civilians, we recommend that the BLS projections of

national employment by occupation be matched to an Army COF. We also recommend that the Civilian Forecasting System (CIVFORS) be used to develop the COF and match it to BLS data. Development alternatives were considered and a recommendation was made to utilize a two-phased effort resulting in the ability to compare BLS projections with those produced by CIVFORS for 14 annual projection periods. This will effectively support the Department of Army's short and long range planning efforts while taking advantage of the investment already made in an existing forecasting system.

CHAPTER 1: INTRODUCTION: PURPOSE AND OBJECTIVES OF THE STUDY

"We must all understand long-range trends and their implications. These implications drive the timing and range of alternatives that we must consider to guide us into the future."
General Carl E. Vuono, Army Chief of Staff.

A major goal of the Army's civilian personnel program is to maximize the contribution of the Army's civilian workforce to the accomplishment of the Army's mission today and in the future. The likelihood of attaining this goal is enhanced by effective efforts to assure that sufficient numbers of qualified civilian personnel are available to the Army. The purpose of this study is to contribute to that goal by providing richer sources of pertinent information for the civilian manpower planning process. In particular, this study develops a modeling methodology for analyzing the impact of current and future socio-economic, technological, demographic, and political events on the Army's recruitment of civilian employees.

Among the specific elements included in this study are:

- A discussion of trends pertinent to long-range planning for Army civilian personnel.
- A discussion of the problems associated with forecasting future recruiting needs.
- A description of how the manpower planning functions which impact on civilian personnel needs are currently carried out.
- A description of baseline data currently available that provides a thorough picture of today's Army civilian workforce as well as national employment.
- A description of how this baseline data can be used to analyze various aspects of problems with future staffing requirements.
- A description of the modeling methodology to construct forecasts of Army civilian personnel requirements.
- Recommendations for implementing forecasting procedures to support the Army civilian manpower planning process.

- A discussion of the impact of future technological, demographic, political, and socio-economic trends on the Army's civilian workforce requirements.

The report is organized as follows. Chapter 2 describes those trends and issues relating to the Army civilian workforce and national labor supply. Chapter 3 considers the Army's current planning environment and how planning for civilian personnel interacts with this environment. Chapter 4 outlines a modeling methodology which would improve the planning capacity for the Army civilian workforce and explores the availability and uses of data sources which provide a thorough "baseline" description of the current manpower situation and historical trends. It sets forth recommendations for implementing forecasting procedures to support the Army civilian manpower planning process. Chapter 5 discusses the impact of future trends on the recruitment of civilians.

CHAPTER 2: FUTURE ISSUES AND TRENDS

One of the purposes of this study is to prepare functional requirements for a model or system which willl provide information on the impact of current and future socio-economic, technological, demographic, and political trends on the Army's recruitment of civilian employees. As a preface to the presentation of that method, this chapter discusses how relevant trends might be identified and indicates how such trends could be incorporated into a forecasting model. This section also contains the description of some current trends.

Identification of Issues and Trends.

This report has identified a number of issues and trends in areas relevant to the Army's civilian employment. These can be categorized as follows:

- Demographic
- Socio-Economic
- Political
- Technological

These issues and trends are described as they relate to occupations and workers in the year 2000. Many sources were studied to compile this list, three of which were especially useful. They are:

- Occupational Outlook Quarterly, Bureau of Labor Statistics, Fall 1987. The summary occupational projections found in this publication are supported by detailed descriptions of the projections and the methodology in Projections 2000, March 1988.

- Workforce 2000, Hudson Institute, June, 1987. This effort was conducted to 'provide a basis for recasting policies and programs in light of the current labor market trends'.

- Meeting Public Demands: Federal Services in the Year 2000, Department of the Treasury, January, 1988. This report identifies trends affecting the ability of the federal government to deliver services between 1988 and the year 2000.

The major trends and issues identified by major category are:

Demographic

- The labor force is projected to grow from 118 million in 1986 to 139 million in 2000. This growth rate of 18% is much slower than the 35% rate of growth observed from 1972 to 1986. The projected growth slows largely because the population growth is projected to slow.

- Younger and older workers will become a smaller part of the labor force. The share of workers:

  — 16 to 24 years of age will decline because the population of their age group declines.

  — 25 to 54 (includes the baby boom generation) will increase.

  — 55 and over will decline because their labor force participation rate will continues to decline, even though the population in their age group will increase.

- Women will continue to increase their share of the labor force rising in numbers from 52 million to 66 million by 2000. The number of women will rise twice as fast as the number of men because the proportion of women who participate in the labor force, especially women 25 to 54 years of age will continue to rise.

- The proportion of whites in the labor force will decrease; while the proportion of blacks and of Asians and others will increase. The proportion of blacks will grow faster than that of whites because of higher birth rates. The proportion of Asians and others will grow faster than that of whites because of immigration and higher birth rates.

- The Hispanic labor force will rise from 8 million in 1986 to 14 million in 2000 (a rise of 74%) due primarily to immigration and the rise in the native-born Hispanic population. The Hispanic share of the labor force will increase from 7% in 1986 to 10% in 2000. (Note that Hispanics are not considered to be a separate racial group; most are classified as white.)

- Immigrants will comprise the largest share of the increase in both the population and the workforce for the first time since World War I.

Socio-Economic

- Employment will continue to grow although more slowly than in the recent past. Employment will increase by 21 million, a rise of 19%. Between 1972 and 1986, employment grew by 27 million (32%).

- The gross national product (GNP), a measure of demand for goods and services will exceed $5 trillion (in real terms) in 2000 — an increase of 40%.

- The integration of the world economy will continue to increase.

- Two wage families will continue to grow.

- Occupations in which a large proportion of workers have college training will be among the fastest growing. Language, math and reasoning skills will be more important in these occupations.

- Occupations in which a large proportion of workers have less than four years of high school generally will be among the slowest growing.

- Driven by rising demand for services, the service-producing sector will provide 20 million new jobs.

- The government sector will provide 1.6 million new jobs, a 9.7% increase.

- The other industries in the service-producing sector and their increase in number of new jobs and percentage terms are:

  — Transportation, communications, and public utilities: 0.5 million, 9.1%.

  — Finance, insurance and real estate: 1.6 million, 25.7%.

  — Wholesale trade: 1.6 million, 26.7%.

  — Retail trade: 4.9 million, 27.2%.

  — Services: 10 million, 42%.

- Of the broad occupation groups shown in Exhibit 2-1, technician and service occupations will grow the fastest.

Exhibit 2-1. Trends in Broad Occupational Groups for 2000.

Occupational Group	Growth Numerical	Growth Percent
Service workers	5,381,000	31
Sales workers	3,728,000	30
Professional workers	3,655,000	27
Executive, admin & managerial	3,033,000	29
Admin support, incl. clerical	2,258,000	11
Precision production, repair	1,669,000	12
Technicians & related support	1,403,000	38
Operators, fabricators, laborers	443,000	3
Agriculture, forestry, fishing	163,000	-5

Source: Workforce 2000

Political

- Federal, State, and local governments will need to address the educational shortcomings of minorities.
- The Federal Budget is likely to decrease in real dollars in an effort to reduce the deficit.

Technological

- Information storage and processing will continue to experience improvements in price/performance ratios. This will result in the application of machine intelligence to jobs that are currently handled by people.
- Electronic communications will be a growth industry replacing print media. It will spawn new software industries to access and utilize the huge array of electronic information which is now available.
- Advances in the understanding of biological processes will vastly improve the productivity of world agriculture and make significant advances in the ability of the health industry to treat and contain today's diseases.

- Superconductive materials are likely to be incorporated into a wide range of industries. These industries will change so dramatically that the results are impossible to project. However, the nation's industries are likely to be reshaped and the rate of change in the economy will be accelerated.

A Summary of the Changing Labor Force

The national labor force is defined as all people who are able and willing to work. The growth trend for the national labor force is the result of many influences in the four categories: Changes in population and birth rates for the different races are Demographic; the increasing incidence of two earner families is Socio-Economic; the increasing life expectancies are due in part to Technological changes; and some would even argue that Political trends in economic policies impact the growth rate of the national labor force (e.g., income tax, maternity leave allowances, tax credits for childcare expenses, and government employment training programs and policies). Thus, the growth of the national labor force used in a projection effort embodies a number of significant trends.

Recent literature on the expected nature of changes in occupations stress that those with the highest expected levels of growth are occupations which require college training, and those requiring less than four years of high school are expected to be among the slowest growing occupations. Historically, Blacks and Hispanics have disproportionately been represented in these slower growing, lower skilled groups. Recommendations to address this problem are concerned with educational policies. With the growth prospects of low-skilled occupations and the increasing share of the labor force made up of minorities, it seems likely that federal, state, and local governments will have a role to play if the employment prospects of these groups are to change. While this may be an important policy issue in the coming years, it does not lend itself to be dealt with in a projection effort of the scope needed to support Army-wide future civilian employment issues. The primary reason is that the only comprehensive set of occupational projections which exist carry no information on the expected racial composition. Another important factor 'tying the hands' of the forecaster is that the Department of Education currently projects educational trends only by the number of degrees awarded by gender, i.e., there is no reliable projection source for minority educational attainment.[1]

Long term forecasts of U.S. gross national product (GNP) expect the U.S. economy to experience about a 40% real growth from 1986 to the end

of the century. This moderate economic growth is expected to occur in an environment in which the integration of the world economy continues. Studies agree that the implication for the U.S. is that service sector growth will continue its recent growth and that its importance to the overall health of the economy will continue.[2]

Using Trends in Army Civilian Workforce Planning

In order to properly analyze predicted trends, one needs to distinguish among kinds of predictions, and then to treat each kind differently in projecting workforce requirements. As an example, consider four distinct predictions which turn out to have crucially different properties:

(1) The Department of Defense has issued a policy directive which Army Headquarters has interpreted as a change in Army mission over the next 10 years, requiring a specific reallocation of budgets and manpower levels across major commands (MACOMs). Army Headquarters has specified in broad outline the nature of this required reallocation.

(2) Continuing large federal government deficits lead many observers to speculate that the next administration will be forced to cut federal expenditures; this is likely to include a sizable cut in defense expenditures.

(3) The predicted growth in the use of computers in the nondefense civilian sector for clerical and accounting-type tasks leads some observers to predict similar growth in Army computer use for these functions.

(4) Because changes in the demographic characteristics of the labor force depend in part on prior changes in the demographic characteristics of the population, some demographic changes in the labor force can be predicted with a reasonable degree of confidence. For example, labor force growth is expected to be much slower between the late 1980's and 2000 than it was

[1] The Department of Education has recently undertaken a projection effort to tie into the Projection 2000 work at BLS. It is likely that this work will produce projections of the skill composition required of the future workforce at some occupational detail. The first fruits of their research is at least 18 months away.

[2] There is some disagreement as to how extensive and how quick resources will move out of the manufacturing sector and into the services sector. Consensus seems to be for very small growth in the manufacturing sector with the service sector experiencing continued high rates of growth.

between the early 1970's and the late 1980's; younger workers will become a smaller percentage of the national workforce; and the percentage of Hispanics in the workforce is expected to grow.

These four examples of predictions would be utilized in a forecasting model in quite different ways. Item 1 represents a concrete expected change in policy from official sources, so that it constitutes an official basis for planning, while its occupational structure would serve as recruiting goals or targets. Item 2 would be translated into a range of possible scenarios and used to produce a series of scenario or "what if" forecasts. The most relevant personnel planning question associated with this type of forecast is "if this scenario turned out to be true, what personnel implications would it have?"

Turning to item 3, the uncertainty surrounding this prediction suggests analyzing the degree to which computerization has affected clerical staffing in the nondefense sector, and the degree to which any such changes have shown up in the Army's use of civilian personnel. As we will indicate later in our report, there is strong evidence that forecasts of very large effects of computerization on clerical employment in the economy as a whole have been highly inaccurate and overstated. Thus, background investigation of the underlying situation is required even before constructing a series of meaningful scenarios.

Finally, item 4 identifies demographic changes which the forecasting framework developed below suggests will not directly affect formal forecasts of Army civilian occupational needs and supplies. This is because the causal linkages running from these demographic factors to the supply of particular occupations to the economy as a whole, and in turn to the net supply of these specific occupations to the Army include so many complex relationships that it is foolhardy, and in fact meaningless, to try to anticipate a stable predictable connection.

The forecasting model described later in this report involves a demand-supply impact analysis. Factors likely to affect future Army civilian personnel levels are classified and analyzed according to whether they affect occupational demand (the Army's need for employees in particular occupations), or occupational supply (the number of available individuals with the required occupational skills). Such attribution to supply or demand effects determines the part of the forecasting model that must be modified to take account of the identified trend.

The four trends listed above can be used to illustrate how trends are classified according to whether they impact demand or supply. The first three trends listed, (change in mission, decrease in budgets, and growing computerization), all enter through the demand side because they affect the Army's need for employees in particular occupations. The last trend, demographic changes in the labor force, enters the forecasting model through the supply side because it affects the number and type of individuals with the required occupational skills available to meet the Army's civilian personnel needs.

Problems in Forecasting

This report provides a strategy for developing a useful forecasting model. However, any achievable forecasting model requires very significant compromises; it is simply impossible both on analytical and data availability grounds to produce the perfectly definitive forecast. The accompanying discussion illustrates some important reasons why this is so.

Consider the problem of forecasting Army demand for civilian personnel by occupation. In constructing such a forecast, one starts a baseline description of the size and occupational mix of Army civilian employment. Such a baseline describes the number of civilian employees in the Army at a specific date, and classifies them by occupational category. Exhibit 2-2 lists some of the additional information that would be needed to help construct a "definitive" or "perfect" forecast.

Items 1 and 2 forecast the funds available for civilian personnel, and the average cost of personnel. Together they determine how many civilian employees the budget permits. Item 3 incorporates nonbudgetary limitations on personnel levels. Item 4 tries to anticipate changes in the Army's broad tasks or responsibilities that may dictate changes in Army manpower requirements. Items 5, 6 and 7 are forecasts of the number of military personnel likely to be available to meet these needs and the division of responsibility between military and civilian personnel in performing the required tasks. Items 8, 9 and 10 identify factors that may effect the number of people needed to perform a specific task; for example, more machines may reduce the number of personnel needed to achieve a given objective.

The definitive forecast would require accurate estimates of many of the items in Exhibit 2-2 which can, at best, be known imperfectly. This imperfect knowledge of future magnitudes, and the difficulty of producing "ironclad" forecasts of items such as 1, 4, 9 and 10 shows that perfectly

EXHIBIT 2-2.
DATA ELEMENTS NEEDED FOR FORECASTING ARMY CIVILIAN EMPLOYMENT SIZE AND MIX

1. The size of the budget available for hiring civilian employees.

2. Changes in the compensation levels paid to civilian employees (compensation, including both direct pay and such features as pensions, affects several things: how many civilians can be employed with a budget of a given size; how much employee turnover there is; and how rapidly people choose to retire).

3. Non-budgetary civilian employment limitations (an example would be a Congressionally set limit on number of civilian employees).

4. Changes in the nature of the Army's mission (for example changes in "doctrine").

5. The number of military personnel, including a separate estimate of the number of reserves.

6. Shifts in the division of responsibilities between military personnel and civilian employees. For example, shifts in military personnel out of Table of Distributions and Allowances (TDA) units.

7. Shifts in the ratio of support staff (TDA) to the underlying military units Table of Organization and Equipment (TOE)

8. Shifts in the technology for performing certain job tasks (for example, the computerization of certain clerical or accounting tasks).

9. The amount and type of machines and equipment available for performing certain tasks.

10. Shifts in the division of responsibilities between civilian employees and contracting-out.

definitive forecasts are impossible to achieve. These difficulties will be illustrated by an examination of item 8 from Exhibit 2-2.

Impacts of Computerization on Clerical Employment

Changes in the technology associated with performing occupational tasks can change the number of individuals needed to accomplish a particular part of the Army's mission. A potentially important ingredient in forecasting Army civilian personnel requirements is identifying which technological trends are likely to impact the need for certain occupations.

In order to examine what is involved in forecasting the effect of technological changes on occupational demand, we considered the effects of computerization on occupational needs. This case is useful both because computerization is widely believed to lead to sizable occupational changes, and because a number of attempts to estimate these changes already exist.

The forecasting problem has at least two parts: forecasting the rate of change of computer technology itself, and forecasting how a given pattern of technological change in computers is likely to translate into changing demand for occupations. As will be seen, both of these forecasting problems turn out to be quite difficult.

In a study on forecasting, Ascher (1978) reviews forecasts of the level of technology as measured by the speed at which a computer performs particular arithmetic operation.[3] Explicit forecasts emerged in the mid-1960's with the introduction of "third generation" computers. Forecasters faced a complicated problem, since the "cues available to computer-capability forecasters in the late 1960's were mixed and somewhat confusing...On the one hand, physicists were pointing out that...the speeds of individual components were approaching ultimate physical limits." On the other hand, engineers designing new systems which would allow simultaneous processing "spoke of **theoretical** computer speeds far greater than the single processor's theoretical limits, and considerably greater than the actual **operational** speeds achieved by 1975."

[3] In particular, "the number of 64-bit fixed additions performed per second by the fastest operational computer under optimal programming conditions." (p.179).

This situation produced forecasts whose degree of accuracy is hardly impressive. Ascher's review indicates that short-run forecasts two to five years in length missed targets by an average of 60%, and longer-term 7 to 9 year forecasts were even less reliable. Errors were largely in one direction: "most forecasts, whether short-term or long-term, overestimated the rate of progress of computer technology." A particularly interesting result of Ascher's review is that, even when studies used the apparently mechanistic technique of trend extrapolation to forecast, the results were still highly variable.[4] Thus, based on historical experience with past forecasts, one should not necessarily anticipate a high degree of accuracy in forecasts of the rate of change of computer capacity.

A second part of the forecasting problem is developing estimates of changes in occupational employment. A recent analysis by Hunt and Hunt (1986) provides extremely useful insights into this forecasting problem. This analysis evaluates a number of studies attempting to forecast changes in clerical employment in response to changing computer technology. In the course of their evaluation they identify a number of difficulties inherent in this forecasting task.

Hunt and Hunt report that for a number of years there have been widespread expectations that productivity gains from office automation will result in declines in clerical employment, or at least declines in clerical staffing ratios. There has, however, been little evidence of such a trend. Hunt and Hunt's analysis indicates why it has been so hard to forecast this employment trend. They also provide critiques of the assumptions behind a number of recent forecasts of clerical employment.

Changes in the level of clerical employment have been traced to three primary factors:

- general economic growth

[4] Ascher explains this as follows: "The problem appears to be that different forecasters define and measure the trend in quite different ways. In this case, Armer's 1966 forecast was based on the assumption that, historically, computer speed increased by a factor of ten every four years, and the Joseph forecast in 1968 was based on a factor-of-ten improvement every ten years. If this much variation can be introduced by arbitrary factors, such as the starting point of the data used to establish the trend line, the objectivity and reliability of trend extrapolation must be questioned." (p.183).

- industry trends (are industries with large numbers of clerical workers growing relatively rapidly or relatively slowly?)

- changing staffing ratios within specific industries.

It is important to remember that changes in these factors can occur simultaneously. For example, if those industries with higher-than-average representation of clerical workers are expanding rapidly, then clerical employment can grow rapidly even if staffing ratios decline.

Hunt and Hunt found that, from 1972 to 1982, general economic growth was responsible for a net increase of 3 to 4 million clerical jobs. Relatively more rapid (with respect to the general economy) growth of clerical intensive industries, especially in the service sector, accounted for 600,000 net growth in clerical jobs; and rising clerical staffing ratios accounted for a net 450,000 increase.

Those who expect declining growth in clerical employment expect a rise in productivity from office automation to cause the staffing ratio of clerical workers to fall. All forecasters reviewed expect staffing ratios to fall, some expect very dramatic falls not only in staffing ratios, but in the total number of clerical workers as well. Hunt and Hunt, however, contend that these forecasters are overlooking a number of very important factors mitigating against a rapid fall in the number of clerical workers:

- The effect of cost reductions on demand. Increased productivity in clerical services make these services cheaper. When the cost of these services goes down, the amount demanded should go up.

- New types of work. Due to a cost reduction in clerical services, office automation is likely to make it cost-effective to perform new types of work.

- The growing information-intensity of output. This continuing rise in information intensity increases the need for clerical services.

- Cost-effectiveness and reliability of new technologies. When all costs are taken into account, the cost of new technologies can be very high and even prohibitive. Moreover, the reliability of new systems may be poor. Thus, new technologies may not be adopted as rapidly as forecasters expect.

The complexity of these factors plus the difficulty of predicting how fast computer speeds will increase and how fast new equipment be adopted throughout industry make it very difficult to forecast exactly what is likely to happen to clerical employment. As Hunt and Hunt put it in discussing specific forecasts, "the level of uncertainty about the technical forecast is so great that interpretation of the occupational employment forecasts which are derived from it becomes little more than an academic exercise...we are unconvinced that technology will evolve as far or as fast" as several forecasters predict.

This view leads Hunt and Hunt to have significant reservations about the value of long-range forecasts:

> "Because of the uncertainties about future demand and the capabilities of future technologies, we would encourage a focus on shorter range occupational forecasting, exactly the opposite approach being suggested by Leontief-Duchin and Roessner. Roessner says that public policymakers need a longer time period for planning. But, if technological change is occurring faster today, then it is becoming even more impossible to develop long-run employment forecasts. Surely it is folly to think that we can peer 15 to 20 years into the future and see the detailed occupational and industrial structure of this nation. In fact, we think that the current BLS efforts, which produce about a 10-year planning horizon, tax existing forecasting abilities to the limit."

This discussion serves not as a declaration that forecasts of this nature should not be attempted, but rather that forecasters need to recognize the complexity of the problem. Although some trends may be revolutionary, subsequent changes in staffing ratios may only be evolutionary. Caution must be used when incorporating trends or assumptions which imply dramatic changes or range far into the future.

CHAPTER 3: THE ARMY'S CURRENT PLANNING ENVIRONMENT

In order to fully appreciate the civilian recruitment issues which the Army is likely to face in the coming years and decades, it is important to understand the process by which current and future manpower levels are determined. This requires knowledge of the current planning process in the Army, and how it generates both military and civilian manpower needs.

This section of the report focuses on the planning process. It describes the current planning environment, indicates how current manpower levels and future needs are generated in that environment and how planning for civilian personnel is part of this process. It then considers current forecasting efforts within the Army which may now or in the future contribute to the development of civilian manpower plans. Principal among these is the Civilian Forecasting System (CIVFORS) of the Headquarters, Department of the Army Decision Support System (HQDADSS). Finally, concepts are discussed which, if incorporated, may improve the planning process for civilian manpower.

A Description of the Army's Planning Process

Force planning is the continuous process by which the Army attempts to perform its vital functions, establishes and revises its requirements and objectives, chooses from among alternative courses of action, and allocates manpower and dollars to achieve the chosen course of action. The Army's primary resource management tool to fulfilling the above is the Planning, Programming, Budgeting, and Execution System (PPBES). This system:

- Operates as a component of the Department of Defense (DOD) Planning, Programming, and Budgeting System (PPBS)
- Provides a sequential, analytical, and integrated approach for identifying requirements
- Facilitates the development and justification of the Army's Program and Budget.

Although there are three sequential phases in the PPBES, the information passes from one phase to another on a continuing cycle. The Planning phase is directed toward the long-range outlook, the Programming Phase looks at the mid-range, and the Budgeting Phase considers the short-range period.

The Planning Phase. The Planning Phase primarily involves force planning. The Deputy Chief of Staff for Operations and Plans (DCSOPS) has responsibility for developing a program force which is capable of dealing with long-range estimates of threats at a given level of risk. Force planning develops The Army Plan (TAP) which establishes an approved force that can be achieved within the expected availability of manpower and money. From this process comes the Program Force and the rationale for the Army Guidance (AG). All force planning is based on the Defense Guidance (DG) developed by the Joint Chiefs of Staff and approved by the Secretary of Defense.

The Programming Phase. The objective of the Programming Phase is to translate planning decisions into a balanced allocation of manpower, materiel, and money. At the same time, the Programming Phase records in the Army's Five Year Defense Plan (FYDP) how these resources are to be distributed. Prepared in consonance with direction provided in the Defense Guidance (DG), the FYDP is published annually and submitted to the Secretary of Defense as the Program Objective Memorandum (POM). The FYDP is reflected annually in the President's budget and identifies the manpower and funds needed beyond the budget year to build, maintain, and sustain the force.

A principal tool in the programming phase is the Total Army Analysis (TAA). TAA is the basic force structuring process which produces a total force structure, both TOE units and the TDA Army (including civilian requirements), that must be sustained in peacetime and expanded during mobilization. In particular, the process is designed to:

- specify force structure for each program year
- provide a basis for adjusting the force structure to meet program constraints
- assess program force sustainability and affordability
- assist in transitioning the proposed force structure into the POM force.

The POM is the basis for the Program and Budget Guidance (PBG) which is issued to the commands and operating agencies as part of the Program Analysis Resource Review (PARR). Command plans are submitted to HQDA by the commands and operating agencies in response to their PBG. These plans are used to update the current force structure (known as the A-Force) and, upon approval by HQDA, are used by the command to prepare the MTOE or TDA, which are documents subsequently used in the Army Authorization Document System (TAADS).

The initial approval of all TDA requirements is the responsibility of the U.S. Army Manpower Requirements and Documentation Agency (USAMRDA), a field operating agency of the ODCSPER. The ultimate approval is by the ODCSOPS. This is the final step in defining the civilian workforce.

The Budgeting Phase. There are three distinct budgeting phases. They are (1) formulation, (2) justification, and (3) execution. Activity during the budgeting phase expresses the need for resources in the form of appropriations. The formulation stage comprises the development of the Army budget estimates based on the approved POM force structure, their review, approval, and inclusion in the President's budget. The justification phase relates to the process of Congressional review and approval. Budget execution is the final phase of the process and includes, among other actions, the apportionment and allocation of funds to Army claimants.

CURRENT PLANNING/FORECASTING EFFORTS WITHIN THE ARMY

This section describes several Army planning/forecasting efforts and associated techniques, and considers their applicability to civilian workforce planning needs.

The following efforts are described:

A. Stationing Decision Support System Study, ODCSOPS.
B. Strategic Studies Institute, US Army War College.
C. Architecture of the Future Army, TRADOC.
D. Manpower Staffing Standard System, USAMRDA
E. Army Manpower Cost System, ODCSPER
F. Civilian Forecasting System, ODCSPER

Other forecasting models were identified during the study as less directly useful for civilian workforce planning. These are summarized in Appendix A.

A. Stationing Decision Support System.

The Stationing Decision Support System is the result of the Long Range Stationing Study (LRSS) which began in the Corps of Engineers as a tool in evaluating and prioritizing installations for expenditure of base improvement resources. The Corps adopted a 30 year projection period since that is the 'payback' period for many major improvements. While still in the development stage, the Corps realized they needed data on Army plans for manning, equipment, and money. As the project grew in scope, it was moved to ODCSOPS.

LRSS started in the fall of 1986 and is currently in the middle of a two year development period after which it will move into an operational role supporting the Army Staff through ODCSOPS. The LRSS is peace-time oriented. Even though most of the Army's time and resources are spent in peace-time, this mode of operation receives relatively little planning attention.

The Stationing Decision Support System employs a :"scenarios forecasting" method. First, four scenarios describing distinctive states of the world and the U. S. Army in the year 2020 are generated. Plausible paths are then developed describing how the Army could transition from its current state to that depicted in the particular scenario. The alternative paths are analyzed to identify commonalities, i.e., those trends, traits, or relationships which are significant in more than one path. The

commonalities suggest key areas for further analysis. Of note is the fact that the approach used in the Stationing Decision Support System is to start in 2020 and work back to the present.

The four scenarios currently in use:

A. U.S. Isolationist: a relatively peaceful world in which the U.S. perception of an external threat is low.

B. U.S. World Peacekeeper: a competitive world of economic trade where external threats, both economic and military, to the U.S. and allied interest are perceptibly increasing.

C. Neonationalism: the use of neonationalism worldwide has significantly suppressed U.S. political, economic, and military influence and has eliminated the presence of the U.S. military overseas.

D. Muted Bipolar World: a productive economic world where U.S. political leadership favors social and welfare investments over those of defense and where U.S. communities increasingly object to military activities at nearby bases.

One of the purposes served by the LRSS is intra-Army communication. To this end, representatives from all major elements of the Army Staff work together in generating scenarios, paths, and in analyzing results.

Strengths of the LRSS approach which are applicable to civilian workforce planning are:

- it highlights the underlying assumptions of scenarios.
- it tends to indicate how sensitive particular forecasts are to changes in underlying assumptions.
- it presents a range of possibilities based on alternative assumptions, to which well-informed users can bring their insights to bear concerning which assumptions make the most sense.
- it presents ideas concerning future Army direction.
- it provides insight concerning relationships between budget, troops, force structure, equipment, facilities and civilian employees.

Civilian employment levels are specifically considered. In addition, the LRSS needs help from the civilian personnel community in order to get 'sanity checks' on its civilian numbers and to provide the necessary link to the civilian forecasting system.

B. Strategic Studies Institute, U. S. Army War College

The Strategic Studies Institute, U.S. Army War College (SSI) employs "the Army's Futurist," Mr. Charles Taylor. In his own words, one of his primary responsibilities is 'to alert planners and decision makers that situations exist that they can alter or manage in the years prior to the year 2010 which could make the future environment more acceptable to the United States and its allies and friends.'

Mr. Taylor's work does not involve developing his own forecasts of specific developments. He stands back a step and looks at the broader picture, ascertaining broad implications of developments hypothesized by others, and determining how the Army or nation might best transition to a given future state of affairs.

He is currently working on four future scenarios packages for the years 2005 and 2020 for the ODCSOPS Long-Range Stationing Study. The scenarios address political, socio-economic, technological, and demographic aspects of the U.S. post-industrial society, and they outline the role of the Army in that setting. The broad background for the scenarios is along the lines of the document Mr. Taylor wrote last year, A World 2010: A Decline of Superpower Influence. In that document, Mr. Taylor presented his analysis of trends in seven categories:

- International order of nations
- Population
- Economies
- Energy sources
- Science, technology, and space
- Sociopolitical factors
- Military disposition of nations

After discussing the state of the world in 2010, Mr. Taylor derives implications for U.S. national security and for the U.S. Army. Among these are:

- The U.S. military is likely to be restructured. Any military structure will contain a significant land fighting component.

- The recruiting pool will shrink unless the targeted recruitment age range is broadened.

- Pay and benefits packages must compete in an increasingly competitive environment.

- Education requirements will be high if the 2010 soldier is to be 'fully capable of comprehending and operating automated, robotic, and computerized systems and highly competent to participate in multilingual computer and video conferencing networks, as well as to teach and train others in the use of specialized military-oriented high-tech equipment and weapons.'

- The active force will be smaller due to long-term deficit reduction programs.

- The reserve force will be larger.

There is a good chance that Mr. Taylor will generate one or more scenarios implying major changes for civilians. For instance, a scenario in which the military services are reorganized, resulting in consolidations of institutions, organizations and bases, would imply impacts on civilian staffing ratios. Although Mr. Taylor does not go into detail on these prospects, he will provide the conceptual framework which the Stationing Decision Support System will need to fill in.

C. Architecture of the Future Army.

The purpose of the Training and Doctrine Command's (TRADOC) Architecture for the Future Army (AFA) effort is 'to develop a plan for the future and a strategy for the management of change that provides a coordinated, consistent, and integrated vision for a disciplined evolution to the future for the total Army.'

The AFA is based on present and future trends. TRADOC planners begin with the situation today and project out for 15 and 30 years. This is in contrast to the LRSS method which begins with the future and works back in to the present. Also, its single scenario approach is in direct contrast to the LRSS use of four scenarios.

Two distinctive characteristics of the AFA approach:

- The forecaster is forced to make hard choices among alternative underlying assumptions (e.g., 'Will budgets rise or fall 5%?') and defend their plausibility.

- The user of the forecasts is presented with one and only one set of projections to use as a basis for planning. This is one of the major reasons for TRADOC proceeding with its own futures effort in spite of the LRSS — they need one set of numbers to use in planning documents.

There are three subefforts to AFA: (1) AirLand Battle-Future (ALB-F) covering fifteen years out for any Army modernization cycle, (2) Army 21 aimed at 15-30 years out, and (3) Advanced Concepts covering possible weapons systems for which there is no estimated time frame. In developing the concepts for these three subefforts, a number of forecasts for change are assessed. Among these are: threat, technology, geopolitical, demographics and societal.

Although the AFA effort attempts to cover the 'Total Army,' it does not forecast or derive implications for the civilian component. In contrast to the LRSS effort, there does not at this time appear to be a request for input from the civilian personnel community.

D. Manpower Staffing Standards System (MS-3)

The MS-3, developed at USAMRDA, is a structured approach to producing industrial engineering based workforce standards, using in-depth analysis at a local level, and the development of mathematical equations which calculate workforce requirements as a function of measurable work load factors.

Currently, only a small percentage of the Army civilian force is covered by manpower standards developed by MS-3. They hope to have 60% of the civilian workforce covered by manpower staffing standards by 1990. The MS-3 standards specify aggregate manpower requirements by work center, but do not specify in detail the skill and grade requirements for each position. MS-3 developed standards do not project manpower requirements. They simply describe the relationships as of the year in which the work was done.

E. Army Manpower Cost System

The development of the Army Manpower Cost System (AMCOS) is one and one-half years into a five year effort. The objective of the effort is to evaluate and compare manpower life cycle costs across components (Active, Reserve, Civilian). The purpose of this comparison is to explore tradeoff costs between components. This information will be helpful in building budget scenarios.

When the project is completed, life cycle and budget figures can be "shared" with other forecasting efforts within the Army.

F. Civilian Forecasting System.

The Army Civilian Forecasting System (CIVFORS) is the civilian component of the Headquarters, Department of the Army Decision Support System (HQDA DSS) which supports all personnel, manpower, and logistics components of the Army. CIVFORS is designed to support analysis and planning by personnel and manpower policy makers and functional managers within HQDA and its field operating agencies. Major system users are in the two proponent agencies, the Director of Civilian Personnel and the Director of Manpower, as well as the Civilian Personnel Directorate in the Total Army Personnel Agency. The system was officially accepted by these two proponents on June 25, 1987.

CIVFORS projects both personnel and manpower data for the U.S. Direct Hire workforce for the current year, budget year, and Five Year Defense Plan period (a total of 7 years). The model uses trends in personnel transactions as well as the projected authorized and budgeted manpower structure to determine the projected number of transactions (hiring levels, separations, retirements, etc.) and end strength. The projections are reported quarterly through the end of the FYDP. CIVFORS is the only system in production which fully integrates both manpower and personnel data.

All projected results can be varied through the CIVFORS user controls to answer a wide range of management questions such as:

- "What would be the effect of a FY88-89 hiring freeze on GS employees in the Army Materiel Command?"
- "What would be the effect of an early retirement program on total strength levels by occupation?"

IMPROVEMENTS TO CIVILIAN WORKFORCE PLANNING

The Army's civilian manpower planning process is driven by the requirements for the uniformed component. Manpower planning for the uniformed component is a centralized system, based on the force structure decisions and procedures described earlier. In contast, civilian manpower planning activities are largely reactive, determined at the installation level in response to the requirements of the uniform force. A totally decentralized system is used to build the civilian component, constrained to budget limitations and OPM manning standards.

One problem with determining civilian requirements is that civilian organizations are not standardized, unlike TOE units which, in general, have a prescribed structure. In addition, the prerogative of the local commands in determining civilian requirements makes the development and utilization of locally based staffing standards difficult. The manpower requirements actually documented in TAADS are not currently based on a consistent use of one methodology, but rather on an ad-hoc analysis using whatever technique is deemed the best available. Moreover, the civilian workforce is not managed to meet these requirements. Instead, the workforce is managed to meet budget requirements as specified in the PBG, where only total civilian spaces are given by command with no regard to skill or grade.

As a result of the 1980 Army Commander's Conference, the DCSPER was instructed to develop a Civilian Force Management Plan (CFMP) which establishes a Civilian Objective Force (COF) to meet the future manning needs of the Army. The COF is the quantitative and qualitative composition of the Army's required civilian workforce that meets force structure and fiscal constraints portrayed over a given planning cycle (e.g. the Five Year Defense Plan). The CFMP is the statement of personnel policy and implementation actions required to move the current civilian workforce into the COF. Such a plan would need to consider not only resource constraints, but also traditional personnel decisions such as retirement rates, attrition, contract activities, hiring freezes, civilianization, and technological changes.

Civilian Objective Force Formulation.

The Civilian Objective Force would be a key element of forecasting for Army civilians. Without an "official" COF, planners would have to use their best judgments to estimate the Army's need for civilians and, in essence, create a "COF" for forecasting purposes. If the COF was developed as described in 1980, it would be determined by ODCSPER planners after consideration of the following issues:

- Mobilization requirements. The civilian workforce should be able to support mobilization requirements with the smallest number of changes necessary from the peacetime posture.

- Resource constraints. The civilian workforce must be supportable by available fiscal resources; the "best" force must be one that most effectively supports Army mission objectives within personnel cost limitations.

- Existing manpower allocations. The COF must be consistent with the program oriented guidance found in the PBG. The COF will establish the series, grade, and other essential personnel dimensions on top of the aggregate manpower allocations in the PBG.

- Career progression. The COF must incorporate the grade and occupation "ladder" required to support the entry, development, and graduation of career interns.

The final requirements for development of COF, and hence the CFMP, must come from decision makers in the Directorate of Civilian Personnel (DCP) and the Directorate of Manpower, Budget, and Force Integration (DMB). These offices would carry the responsibilities for the development of the COF and CFMP as fit their mission.

The development of a COF would support the management of the civilian workforce by skill and grade level subject to budget constraints. In addition, it would incorporate known planning and management concerns of the personnel community with respect to career program management, losses, retirements, and accessions. Thus, the development of the COF would add an improvement to the overall civilian workforce planning process. To date, the COF has not been developed primarily due to the lack of an automated system for implementing the CFMP, in addition to describing the COF. The development and acceptance of CIVFORS provides a management tool to support the development of the COF.

CHAPTER 4: MODEL DEVELOPMENT TO IMPROVE PLANNING CAPABILITY

As stated previously, one of the primary purposes of this study is to identify and describe the data, functions, and use of a forecasting model which will improve the planning capacity of the Army in regard to the civilian workforce. To be most useful, the model must:

- fit into the current and future Army planning environment,
- make use of data which is available, reliable, and consistent with other operational systems,
- provide the ability to perform projections of the Army civilian workforce requirements in response to "what if" scenarios of changes in Army mission, environment, and force structure,
- identify occupations or regions of the country in which there may be problems filling the projected Army need for civilians, and
- be feasible in terms of development costs and operational requirements.

This chapter describes the baseline data and modeling methodology necessary to support Army civilian workforce planning. First, the baseline data will be discussed in two separate categories: that needed to support the development of the Army's COF, and that needed to adequately describe the national economy's use of labor over the projection period. Then, the modeling methodology is presented including the assumptions and recommended interface with the CIVFORS model.

BASELINE DATA

This section describes the baseline data which can be effectively used in civilian workforce planning. Baseline data describes the current posture of the Army civilian workforce and the national labor requirements. We describe below the sources of raw data which can be used for both. We also present the baseline definitions and sample outputs.

Army Historical Data

This study has identified two sources of historic data which can be used to support the determination of an Army COF. These sources are CIVFORS and the Defense Manpower Data Center (DMDC).

CIVFORS. The data bases created and/or used by CIVFORS contain by far the best source of data for use as a baseline. Exhibit 4-1 shows the types of data available from CIVFORS while Exhibit 4-2 gives the dimensions which can be used to describe this data. As an example, we have computed for the occupational series found in CIVFORS the turnover rates and the fill rates by MACOM. Exhibits 4-3 through 4-8 present turnover rates and fill rates for selected series in TRADOC, AMC, and FORSCOM. Data for all series are contained in Appendix B.

DMDC. Historical strength data on Army Civilians is retained by DMDC as a result of a DOD directive to each of the services. This data is valid for comparison of occupational series back to 1978. In addition to those dimensions found in CIVFORS, the DMDC reports data by PATCO[5] and education level. We have used this data to define staffing ratios for the total civilian workforce by command, and by region. Exhibits 4-9 through 4-18 show the trends in staffing ratios for sample occupations in each category for the period FY78 to FY87. Data for all occupation series are contained in Appendix C.

[5] PATCO is a reference to OPM aggregations of occupations into professional, administrative, technical, clerical, and other categories.

Exhibit 4-1.

Data Available from CIVFORS

Data Types	Source	Start Date
Authorization Strength	TAADS	84-07
Requirement Strength	TAADS	84-07
Actual Strength	CIVPERSINS	83-12
Accessions	CIVPERSINS	83-12
Retirements	CIVPERSINS	83-12
Attrition	CIVPERSINS	83-12
Transfers	CIVPERSINS	83-12
Promotions	CIVPERSINS	83-12
Reassignments	CIVPERSINS	83-12
Approved Strength	MADIMS	86-09
Extended Strength	MADIMS	86-09
Manyear	MADIMS	85-10
Costs	MADIMS	83-10

Exhibit 4-2.

Data Dimensions Available from CIVFORS

Personnel Data Dimensions	**Authorization/Budget Data Dimensions**
Command	Resource Command
Occupation Series Groups	Program Development Increment Package (PDIP)
Grade Groups	Program Element
Pay Plan Groups	Army Management Structure Code (AMSCO)
Geographic Location	Grade
Years of Service	Occupation Series
Gender	Pay Plan
Race/national origin	Appropriation
Career Program	Program/Subprogram
Position Tenure	Geographic Location
Funding Category	
Work Schedule	
AMSCO	

EXHIBIT 4-3. TURNOVER RATE - TRADOC
SELECTED SERIES

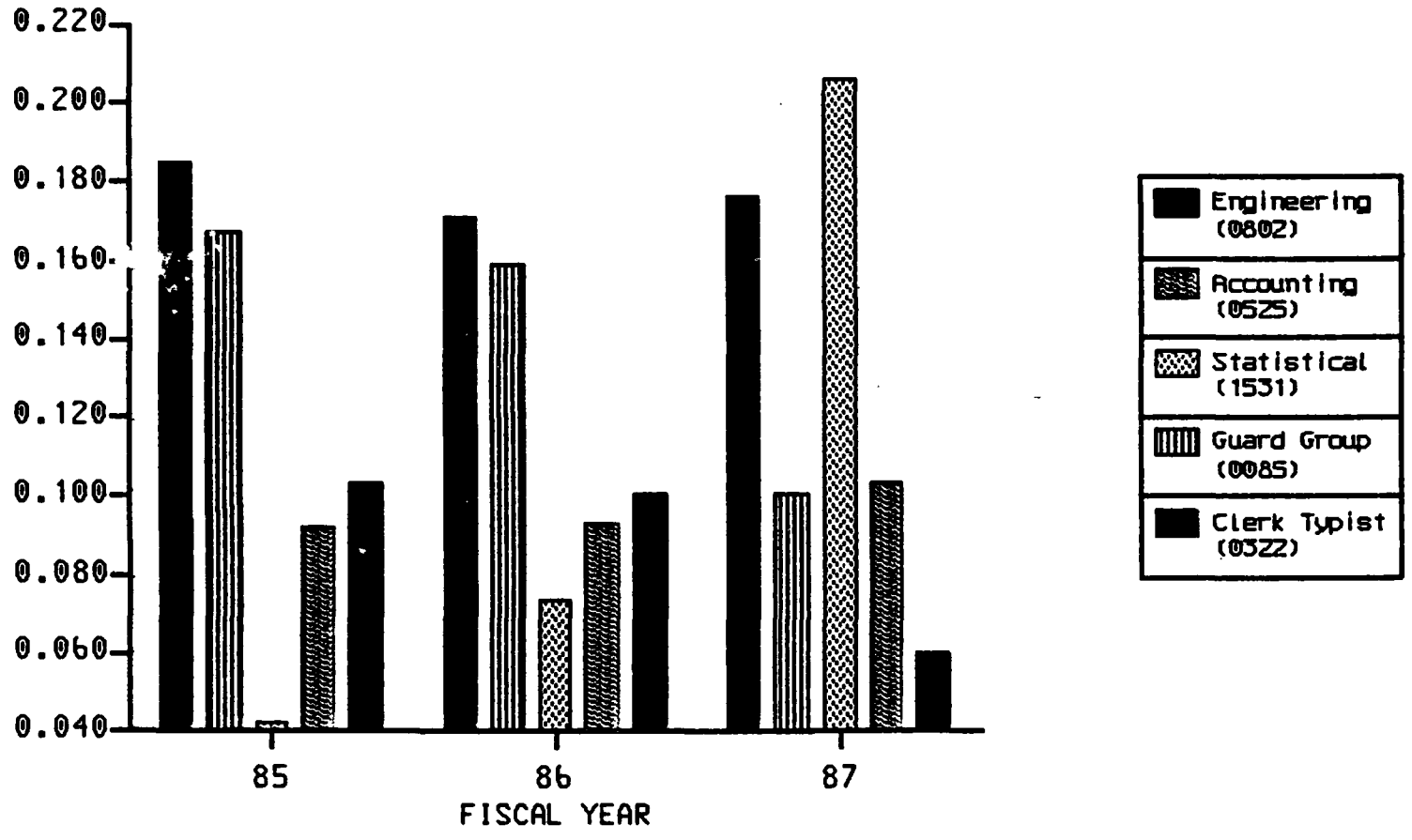


EXHIBIT 4-4. TURNOVER RATE - AMC
SELECTED SERIES

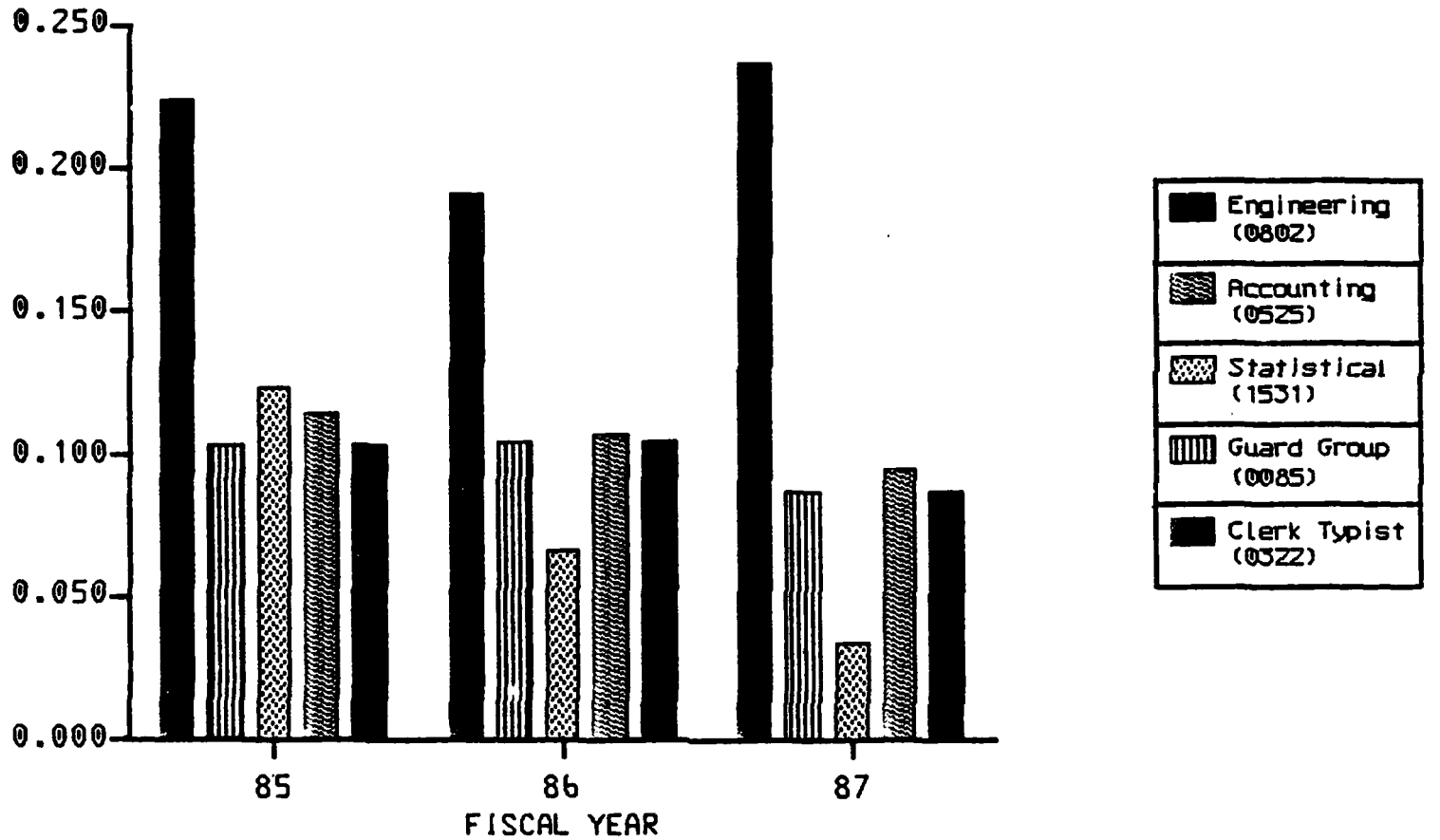


EXHIBIT 4-5. TURNOVER RATE - FORSCOM
SELECTED SERIES

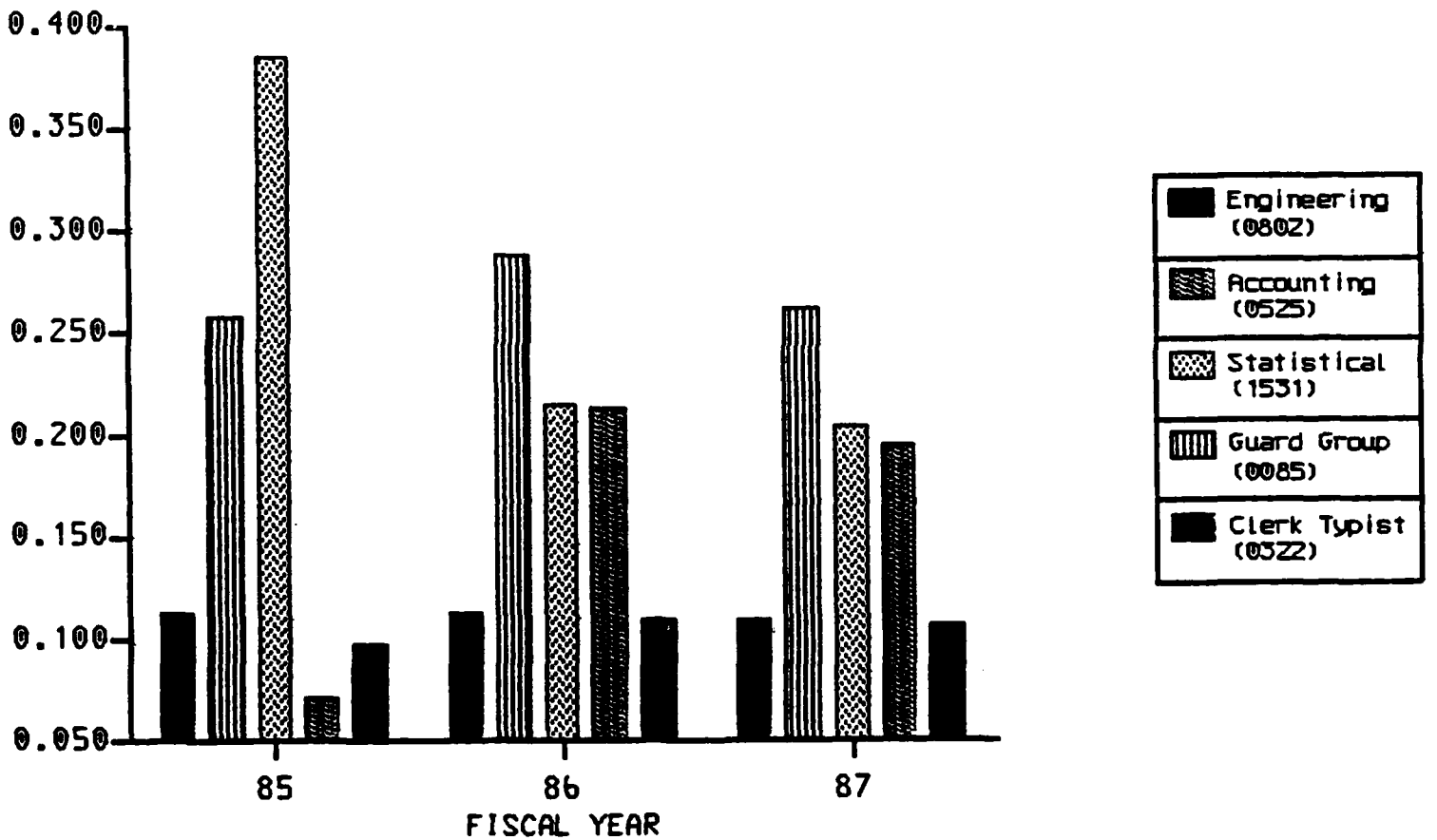


EXHIBIT 4-6. FILL RATE - TRADOC
SELECTED SERIES

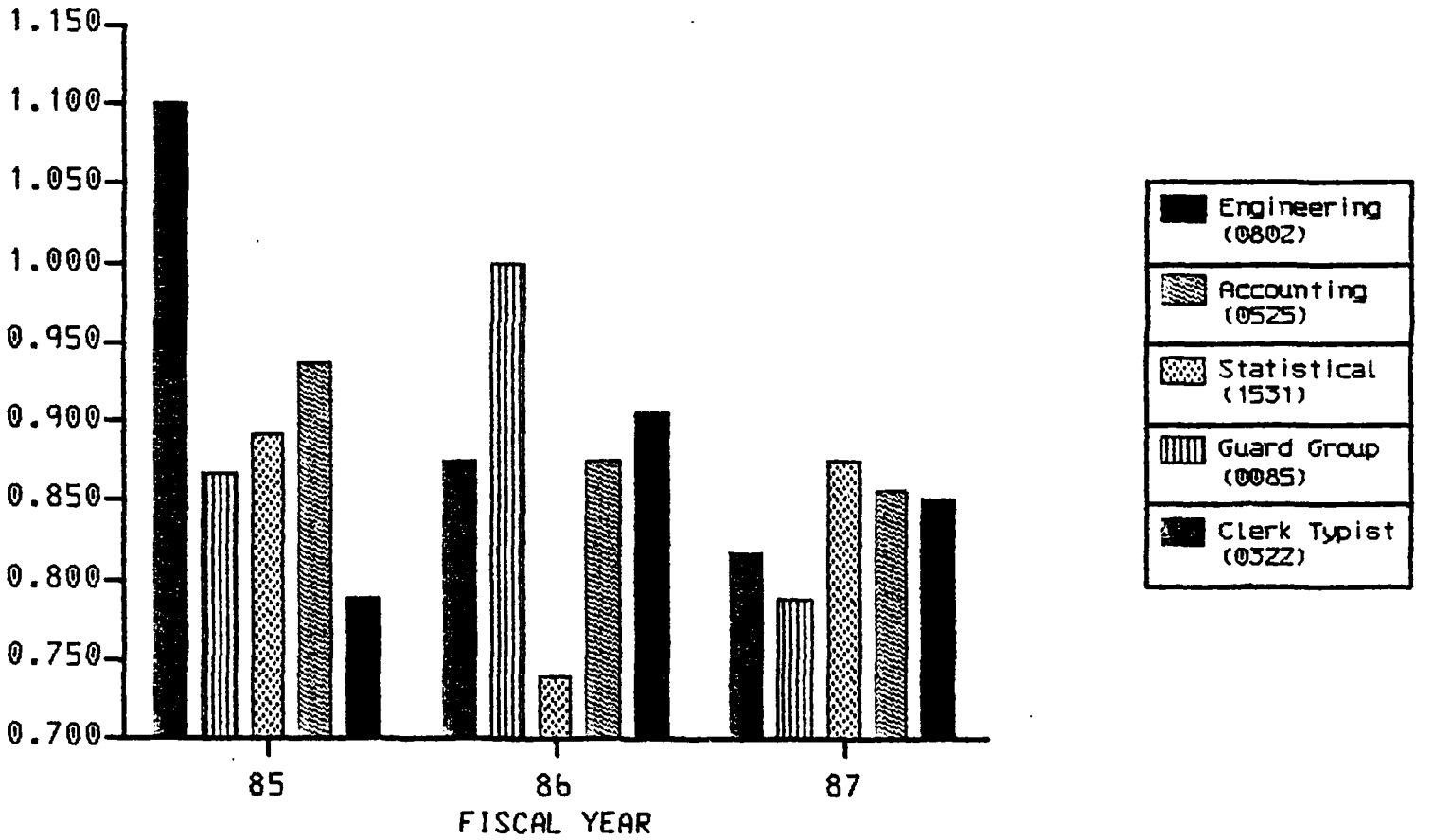


EXHIBIT 4-7. FILL RATE - AMC
SELECTED SERIES

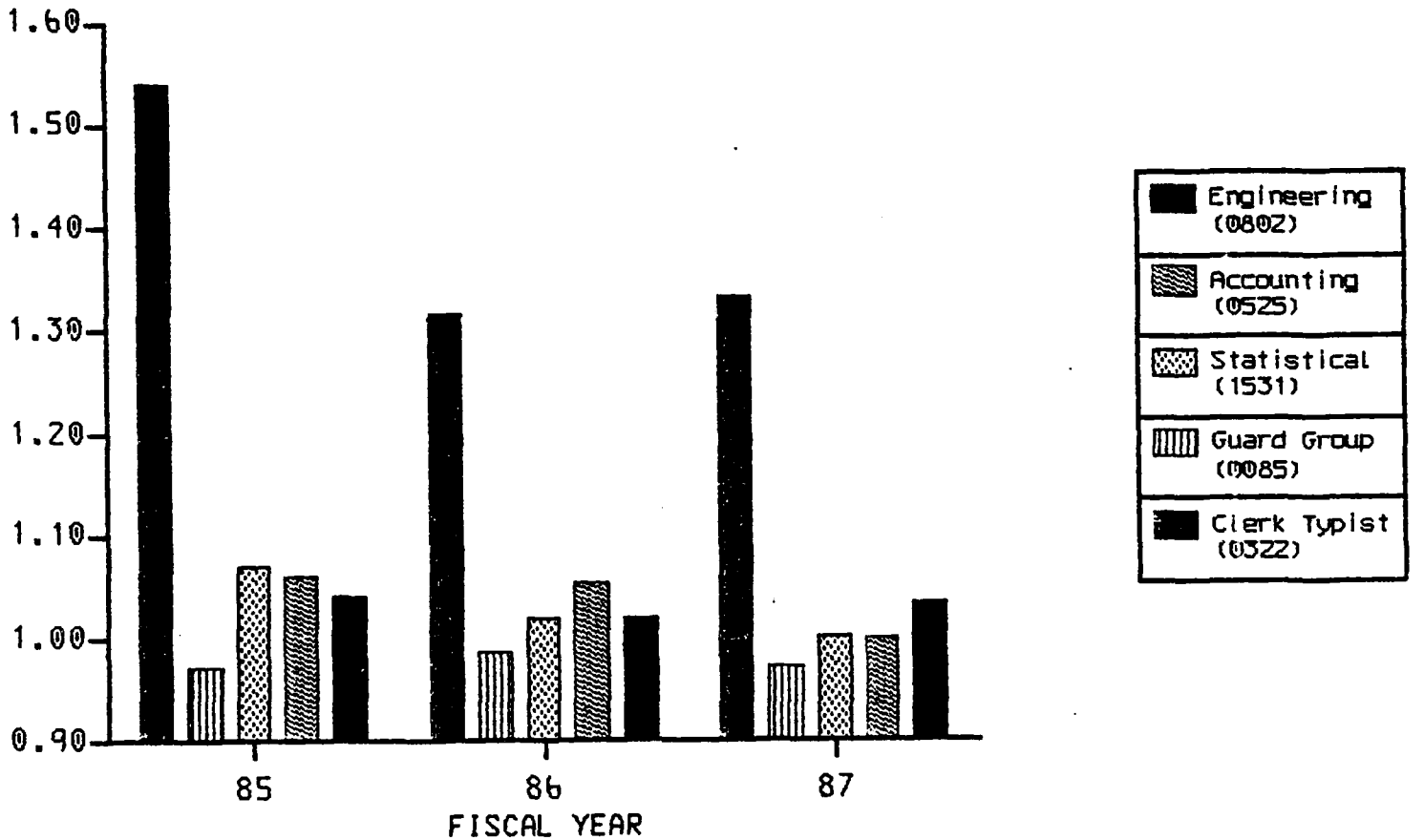


EXHIBIT 4-8. FILL RATE FORSCOM
SELECTED SERIES

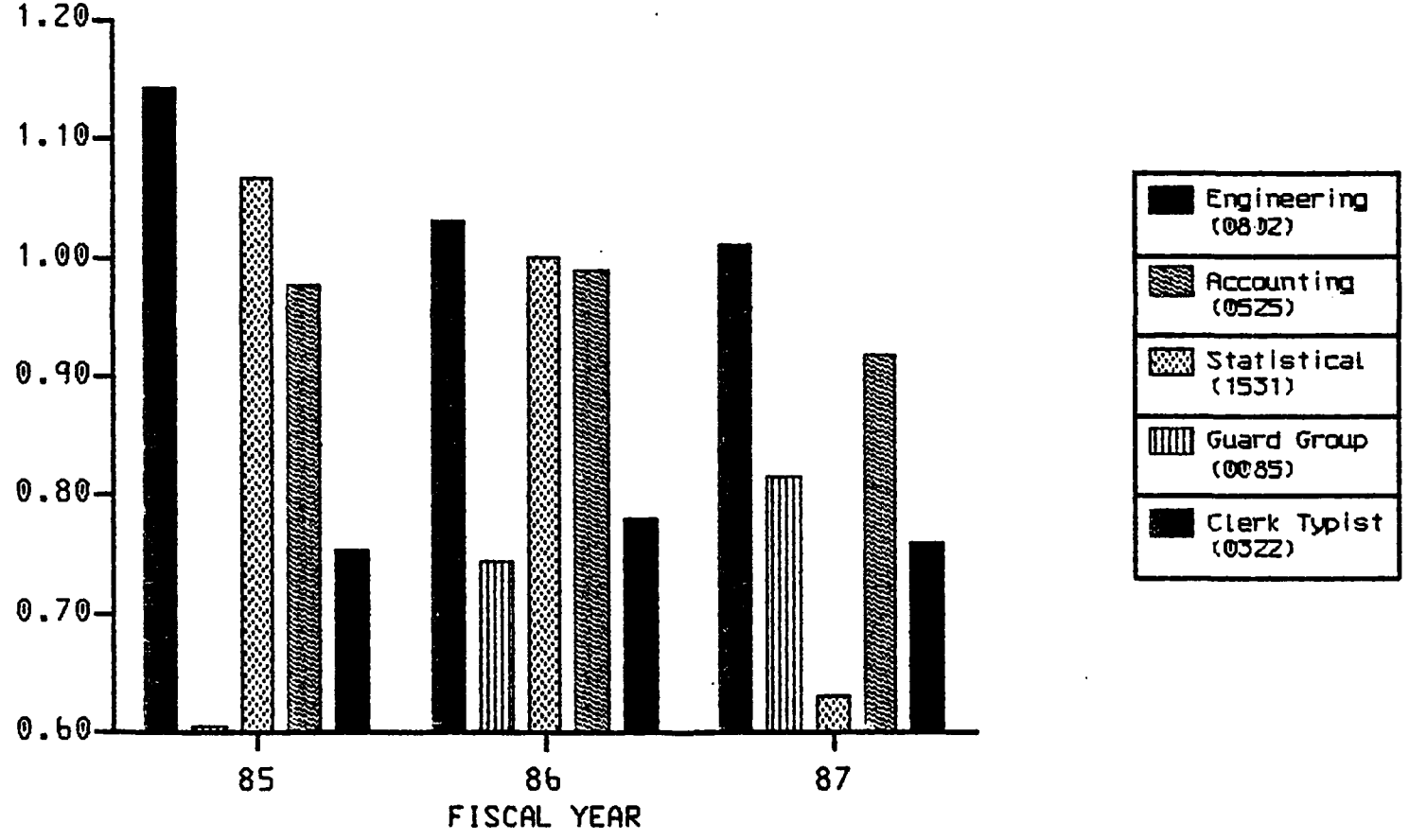


EXHIBIT 4-9. STAFFING GROWTH - TOTAL ARMY FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	1,399	0	-100
2650 Elec Systems Mech	844	0	-100
0316 Dict Mach Trans	1,250	1	-99
2614 Elec Eqmpt Repair	4,247	33	-99
0356 Data Transcriber	2,491	1,373	-45
0545 Mil Pay Spec	2,664	2,625	-1
0322 Clerk Typist	15,035	15,171	1
0801 General Engineer	3,508	5,094	45
3507 Deckhand Sailor	14	309	2,107
1550 Computer Science	2	259	12,850
2604 Elec Mechanic	0	5,110	.
0679 Medical Clerk	0	2,394	.

EXHIBIT 4-10. STAFFING GROWTH - 1ST ARMY GROUP
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	368	0	-100
2650 Elec Systems Mech	137	0	-100
0316 Dict Mach Trans	345	0	-100
2614 Elec Eqmpt Repair	1,951	15	-99
0356 Data Transcriber	644	300	-53
0545 Mil Pay Spec	504	527	5
0322 Clerk Typist	4,887	4,252	13
0801 General Engineer	1,473	1,992	35
3507 Deckhand Sailor	0	0	0
1550 Computer Science	1	219	21,900
2604 Elec Mechanic	0	1,912	.
0679 Medical Clerk	0	338	.

EXHIBIT 4-11. STAFFING GROWTH - 2ND ARMY GROUP
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	240	0	-100
2650 Elec Systems Mech	289	0	-100
0316 Dict Mach Trans	166	1	-99
2614 Elec Eqmpt Repair	646	3	-99
0356 Data Transcriber	487	239	-51
0545 Mil Pay Spec	605	651	1
0322 Clerk Typist	2,659	2,762	4
0801 General Engineer	814	1,144	41
3507 Deckhand Sailor	0	141	.
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	828	.
0679 Medical Clerk	0	598	.

EXHIBIT 4-12. STAFFING GROWTH - 4TH ARMY GROUP
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	169	0	-100
2650 Elec Systems Mech	0	0	-100
0316 Dict Mach Trans	0	0	0
2614 Elec Eqmpt Repair	176	1	-99
0356 Data Transcriber	348	241	-31
0545 Mil Pay Spec	770	620	-19
0322 Clerk Typist	1,488	1,442	-3
0801 General Engineer	383	502	31
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	242	.
0679 Medical Clerk	0	0	0

EXHIBIT 4-13. STAFFING GROWTH - 5TH ARMY GROUP
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	263	0	-100
2650 Elec Systems Mech	362	0	-100
0316 Dict Mach Trans	305	0	0
2614 Elec Eqmpt Repair	493	7	-99
0356 Data Transcriber	482	260	-46
0545 Mil Pay Spec	513	484	-6
0322 Clerk Typist	2,811	2,714	-3
0801 General Engineer	503	834	66
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	658	.
0679 Medical Clerk	0	594	0

EXHIBIT 4-14. STAFFING GROWTH - 6TH ARMY GROUP
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	239	0	-100
2650 Elec Systems Mech	0	0	-100
0316 Dict Mach Trans	273	0	0
2614 Elec Eqmpt Repair	955	6	-99
0356 Data Transcriber	405	225	-44
0545 Mil Pay Spec	238	297	25
0322 Clerk Typist	1,761	2,164	23
0801 General Engineer	178	250	40
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	1,434	.
0679 Medical Clerk	0	622	.

EXHIBIT 4-15. STAFFING GROWTH - OCONUS FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	120	0	-100
2650 Elec Systems Mech	0	0	0
0316 Dict Mach Trans	0	0	0
2614 Elec Eqmpt Repair	0	0	0
0356 Data Transcriber	125	108	-14
0545 Mil Pay Spec	0	0	0
0322 Clerk Typist	1,430	1,837	28
0801 General Engineer	157	372	137
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	1,434	.
0679 Medical Clerk	0	217	.

EXHIBIT 4-16. STAFFING GROWTH - TRADOC
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	222	0	-100
2650 Elec Systems Mech	205	0	-100
0316 Dict Mach Trans	116	0	-100
2614 Elec Eqmpt Repair	325	5	-98
0356 Data Transcriber	368	143	-61
0545 Mil Pay Spec	913	796	-13
0322 Clerk Typist	2,227	2,289	3
0801 General Engineer	126	199	58
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	306	.
0679 Medical Clerk	0	0	0

EXHIBIT 4-17. STAFFING GROWTH - AMC
FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	109	0	-100
2650 Elec Systems Mech	569	0	-100
0316 Dict Mach Trans	0	0	0
2614 Elec Eqmpt Repair	2,286	5	-99
0356 Data Transcriber	771	310	-60
0545 Mil Pay Spec	105	77	-27
0322 Clerk Typist	4,288	3,120	-27
0801 General Engineer	2,608	3,345	28
3507 Deckhand Sailor	0	0	0
1550 Computer Science	2	200	9,900
2604 Elec Mechanic	0	2,914	.
0679 Medical Clerk	0	0	0

EXHIBIT 4-18. STAFFING GROWTH - FORSCOM FOR SELECTED OCCUPATIONS

Occupational Series	FY78 Endstrength	FY87 Endstrength	Pct Growth
0520 Accts Maint Clerk	289	0	-100
2650 Elec Systems Mech	0	0	0
0316 Dict Mach Trans	0	0	0
2614 Elec Eqmpt Repair	498	4	-99
0356 Data Transcriber	431	214	-50
0545 Mil Pay Spec	613	805	31
0322 Clerk Typist	1,747	1,690	-3
0801 General Engineer	127	200	57
3507 Deckhand Sailor	0	0	0
1550 Computer Science	0	0	0
2604 Elec Mechanic	0	428	.
0679 Medical Clerk	0	0	0

National Economy Employment Baseline Data

A key element in the determination of occupations likely to pose a staffing problem for the Army, is a reliable database to support time series and trend analysis of labor force statistics. As will be explained below, the analysis of Army civilian employment will depend on the comparison of the Army's COF to projections of national employment on an occupational basis. We have identified three sources which contain such data: the 'Projections 2000' effort of the Bureau of Labor Statistics, U.S. Department of Labor; Bureau of Census, U.S. Department of Commerce; and a model developed by Data Resources, Inc. (DRI).

BLS Projections 2000

The Office of Economic Growth (OEG) in the Bureau of Labor Statistics (BLS), U.S. Department of Labor, is charged with the responsibility of projecting the occupational needs of the economy. The OEG's projections are produced bienially. Generally the time horizon of the projections is 10 to 15 years. The most recent study, done in September 1987, was for the year 2000.[6]

BLS monitors participation rates for various groups of the population (by age, sex, race) and conducts in-house research on how to appropriately project these rates. Also of note is the fact that BLS had access to the Census Bureau's not yet public 1986-based population projections for their study. BLS used these census projections in the estimation of total consumption and the size of the national employment. The BLS study contains, arguably, the best estimate of national employment needs of any currently available study.

Important features of the BLS effort are that it:

- Incorporates the most up-to-date data on national labor supply constraints out to year 2000.
- Provides employment by *occupation* in the year 2000. Usually, forecasts provide employment by industry only.

[6] "Projections 2000," U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2302, March 1988.

- Combines employment by the Federal Government (Defense and non-Defense) with State and Local government employment. While BLS does conduct research on the economy-wide impact of Defense expenditures (BLS, Division of Occupation Outlook), its treatment of Defense in the 'Projections to 2000' effort is somewhat superficial.

- Presents results for the year 2000 *only,* i.e., there is no description of the path *to* 2000, just the snapshot of employment *in* 2000.

The national labor force is necessarily constrained by the size of the domestic population in any given year. Thus, OEG's national employment projections begin with extrapolations of the domestic population and data on labor force participation. The former is provided by the Department of Commerce Bureau of the Census, while the latter is done by BLS based on sample data collected annually. The Census projections are done by age, sex, and race for various scenarios. OEG uses two scenarios (the high and middle migration scenarios) as the points of departure. Labor force participation rates for each age-sex-race group involve analyzing historic growth rates. Extrapolating the participation rate to the target year sometimes involves modification if the projections become inconsistent with cross-sectional analysis; strict application of standard extrapolation methods in itself does not ensure reasonable results. Careful analysis of tentative projections for anomalies is a critical step in the development of projections.

The next step requires projecting the aggregate economy of the U.S. to the year 2000. To accomplish this, OEG uses an established macroeconomic model developed, maintained, and updated by Wharton Econometric Forecasting Associates (WEFA). Even though the WEFA model is very complex, it still leaves many variables undetermined. In particular it requires that OEG specify the values of approximately 900 variables. Once specified, the WEFA model produces 4 aggregate components of gross national product: consumption, foreign trade, government, and investment. Each one of these components is then decomposed to the various products produced by U.S. industry. For example, if the total level of consumer expenditures is forecasted to a million dollars in some year, OEG breaks it down to determine that, say, one-fifth was spent on autos, one-tenth on food, etc.

The distribution used to decompose the 4 categories of final demand for the year 2000 is different than the distribution for 1988. The differences reflect changes in the industrial composition of each component due to technological and economic change. For instance, BLS believes that

computers and robots will represent an increasing share of business fixed investment in the future. This view of the future is reflected in the distribution by increasing the value of the computer industry share of business fixed investment. But how much this share is increased, and for how long, is ultimately a judgment which an informed analyst has to make.

The above process results in an estimate of consumer demand each industry faces. This list of demand by industry (known as a 'bill of goods') is then translated into the industrial production levels which would be required if the economy were to satisfy this bill of goods. This step is accomplished via an input-output (IO) table. The use of the IO table ensures consistency between demand and output, and allows adjustments to be made for changes in technology and product substitution. Such adjustments are based on the best available information consistent with other adjustments and projections. This step requires several iterations of changes, new projections, and review before the final level of industrial production is determined.

The resulting estimates of industrial production are then translated into employment by industry. This step involves forecasting changes in productivity for each industry. Productivity changes, in turn, are based on detailed 'analysis of historical and recent trends, special industry studies conducted by the staff, and industry technology studies from BLS's Office of Productivity and Technology'. Once the level of total employment by industry is known, the final step is to determine the occupational composition of employment by industry; in other words, industrial staffing patterns are applied to industrial employment. Future staffing patterns for the more than 200 industries of the BLS model are projected using several techniques. As described in Projections 2000, 'historical trends are reviewed to identify trends; factors underlying the trends are identified through analytical studies of specific industries and occupations, technological change, and a wide variety of economic data; and judgments are made as to how the (staffing) pattern will change.' To arrive at the total employment figure for a given occupation, the relevant employment figure is summed across all industries.

Two important conclusions emerge from this summary of the BLS methodology. First, BLS has committed significant resources developing a system which they believe produces a thorough, sophisticated and meaningful projection of trends in U.S. occupational employment. This BLS projection effort demonstrates the very sizable personnel and budgetary inputs needed to construct a sound and defensible forecast. Using these BLS occupational projections obviates the necessity of

duplicating their efforts at very substantial costs. Thus, the Army should use these projections rather than re-invent the wheel. Second, our discussion of their multi-step analysis indicates the pervasive need in producing occupational projections to make a sizable number of assumptions about future trends in productivity, technological change, and consumer tastes. Such assumptions can be based in part on analysis of historical trends, but also require a significant amount of judgment from the analyst. These assumptions play a crucial part in determining the actual forecasts. Thus, there is no escape from the need for informed judgments by knowledgeable analysts.

Bureau of Census Historical Data

Data by occupation will be provided from BLS for the year 1986 and the year 2000. Unfortunately, due to changing occupational definitions and the addition/deletion of occupations, BLS does not maintain any historical time series on occupational data. Therefore, the historical occupation series is obtained from the Current Population Survey (CPS) conducted by the Bureau of the Census, Department of Commerce. Unlike the projections, which are strictly for numbers of employed people, this historical data also contains information about the gender and racial composition of national employment. This data is only available on a consistent basis starting in 1983.[7]

Historical data on wage and earnings will be useful for comparison of public and private sector pay. Unfortunately, there is no source of wage and earnings data available at any extensive level of occupational detail. BLS does produce on annual comparison of government and private sector earnings by broad aggregations of Professional, Administrative, Technical, Clerical and Other (PATCO). Each of these categories has some occupational detail. Coverage of this survey varies year to year, but the last survey has the most extensive service sector coverage of any survey to date. Since the service sector is expected to provide the greatest percentage of job growth as well as be subject to much technological impact, this data

[7] Crosswalks linking to the CIVFORS minor occupational codes will be provided for the BLS data (based on the Office of Employment Statistics Classification) and the Census data (based on the Census Occupational Classification).

[8] National Survey of Professional, Administrative, Technical, Clerical Pay: Private Sector Industries, March 1987," Bureau of Labor Statistics, Department of Labor, Bulletin 2290.

will serve as the baseline for the wage and earnings by occupation.[8] Even though the occupational detail is not as extensive as those of the OEG on CIVFORS series, it represents the best occupational earnings data available for comparison to the data now maintained in the CIVFORS system.

Defense Economic Impact Modeling System and the Defense Interindustry Forecasting System.

The Department of Defense, Office of Program Analysis and Evaluation, Economic Analysis Division, currently forecasts the impact of defense expenditures on the U.S. economy over the course of the Five Year Defense Plan (FYDP). The model, known as the Department of Defense Economic Impact Modeling System (DEIMS), was developed by Data Resources, Inc. (DRI). DRI also operates a commercial version of the model under the name of Defense Interindustry Forecasting System (DIFS).[9]

The models are driven by defense expenditures, which need to be specified for each year of the FYDP by 150 or so categories in the case of DEIMS and 10 categories in the case of DIFS. This information is used in conjunction with the DRI Macro model to derive defense related production and employment for each year of the FYDP by each of 432 agricultural, mining, construction, manufacturing, and service industries of the DRI interindustry model. These results are fed into three additional modules which translate the industry impacts into defense-related employment by occupation (679 categories), production of 55 critical materials, and state level information. The ten budget categories as found in DIFS are listed in Exhibit 4-19.

In order to turn employment by industry into employment by occupation, DRI uses staffing ratios for each industry. These staffing ratios describe, by industry, the percentage of the total employment assigned to each of the 679 occupations. The staffing ratios are based on the BLS projection effort (described above). Since BLS provides projected staffing patterns for the year 2000 only, DRI uses linear interpolation to determine the staffing patterns between the current year and the end of the current FYDP.

[9] A point of contact for DEIMS is Paul Dickens in the Economic Analysis Division, for DIFS contact Tony Barbera or Joyce Borthwick at DRI (663-7600).

Exhibit 4-19.

Defense Budget Categories of DIFS

1. Military Personnel
2. Operation and Maintenance
3. Aircraft Procurement
4. Missile Procurement
5. Weapons and Tracked Vehicle Procurement
6. Ammunition Procurement
7. Ships and Conversions Procurement
8. Other Procurement
9. Research, Development, Test and Evaluation
10. Military Construction and Family Housing

The applicability of DEIMS or DIFS for the Army's effort is its ability to provide national employment occupational detail for the years of the FYDP corresponding to the CIVFORS projection period. If CIVFORS were enhanced to provide projections for 12-14 years (i.e., out to the BLS projection year), it may appear that the output of DEIMS/DIFS only covers half the period. In terms of importance though, the years corresponding to the FYDP are arguably the most critical for the Army. Any projection beyond five years will be driven by budget numbers which are unofficial. Even though such budget figures are likely to be prepared with extreme care (e.g., those available from the LRSS) they will by definition lack the authority of the FYDP.

DRI has indicated that the cost of a complete DIFS run, incorporating a set of Army provided assumptions, would run 13 to 15 thousand dollars. The high end of that range represents extending the projection horizon out to twelve years (versus the current 5) assuming the Army provides defense budget figures for each of the years beyond those of the FYDP. While DEIMS and DIFS model the impact of the entire defense budget, the DIFS model breaks out Army detail for the sectors relating to procurement (sectors 3-8) and research (sector 9). DRI did indicate that, if the Army provided data on defense budgets over the forecast horizon, they could provide estimates of the Army-related employment in the rest of the economy for approximately 3 to 5 thousand dollars.[10] Such information is though, of secondary importance for the Army projection effort.

An example of the type of information available from the DIFS model is provided in Exhibit 4-20. The exhibit lists information for the various types of engineering occupations used through the U.S. economy. For each type of engineering occupation, Exhibit 4-20 reports the total number employed economy-wide, the number of those supported from defense related expenditures, and defense-related employment as a percentage of total employment.

[10] These costs are estimates only, and should not be interpreted as implying any commitment by DRI.

Exhibit 4-20.

Total and Defense-Related Employment of Engineers, 1986 (thousands of persons, except as noted)

Engineer Category	Total	Defense	Percent
Aeronautical and Astronautical	45.5	20.8	45.8
Chemical	53.8	3.6	6.8
Civil, including Traffic	165.3	7.6	4.6
Electrical and Electronics	387.3	52.0	13.4
Industrial	124.3	16.0	12.9
Mechanical	233.1	26.7	11.5
Metallurgist: metal, ceramic, material	18.4	3.0	16.2
Mining, including Mine Safety	4.8	0.2	5.0
Nuclear	6.2	0.9	14.6
Petroleum	18.0	0.9	4.8
Other	224.7	33.2	14.8

Source: "The Defense Interindustry Forecasting System: Design and Applications," Data Resources Inc., Washington, D.C., March 1987.

ENHANCEMENTS TO CIVFORS

This section describes the modeling requirements and the enhancements to CIVFORS necessary to support COF development and CFMP implementation, as well as long range recruiting assessment. First, the functions required to identify the Army's demand for civilians will be given. The discussion then turns to the functions needed to identify the occupations in which there may exist problems filling the projected Army need. Lastly, we define the current CIVFORS modeling capabilities and provide several alternatives for enhancing these capabilities.

Our primary interest is in forecasting the level and especially the occupational mix or composition of the Army civilian workforce. To this end, the following three tasks must be accomplished:

(i) Forecast Army civilian demand. An example of such a forecast would be the number of scientists the Army would want to hire in 10 years if there was no problem in attracting an ample number of scientists into the Army.

(ii) Identify occupations which, in the light of the demand forecasts developed in (i), may present staffing problems. To continue the example, the concern becomes whether the Army can attract a sufficient number of scientists at the salaries the Army expects to offer to meet the forecasted demand 10 years in the future.

(iii) Shortfall evaluation and personnel policy implications. If (ii) identifies a possible supply shortfall for a particular occupation, what alternate adjustments might be made in response? Could the shortfall be cut by incentives to lessen turnover of existing employees, etc.?

Several comments are in order about these three analytical objectives. First, it is important to recognize that each of the three involve distinctive difficulties, so that a relatively successful effort to provide a demand forecast does not necessarily imply an ability to successfully provide the other two. Second, item (ii) might be seen as involving an attempt to provide a supply estimate for each occupation, but we will argue that such a project is beyond current forecasting capabilities, as well as being far beyond the resources likely to be available for Army civilian forecasting efforts. Thus, we will suggest a less massive and less demanding procedure which is expected to provide the required results.

Modeling the Army's Future Demand for Civilian Occupations

The first forecasting task involves generating demand forecasts by occupation. Exhibit 4-21 is useful for describing the components of this task. The bottom leftmost box, labelled "Army's Force Structure", indicates the current distribution of occupations of the Army's civilian personnel. CIVFORS provides this distribution for over 200 occupations. Moreover, CIVFORS contains considerable additional detail including but not limited to, information by MACOM, by region, by grade/payplan, and by career program. Distributional counts can be obtained for so-called "required" slots, authorized slots, authorized/budgeted slots, and actual strength.

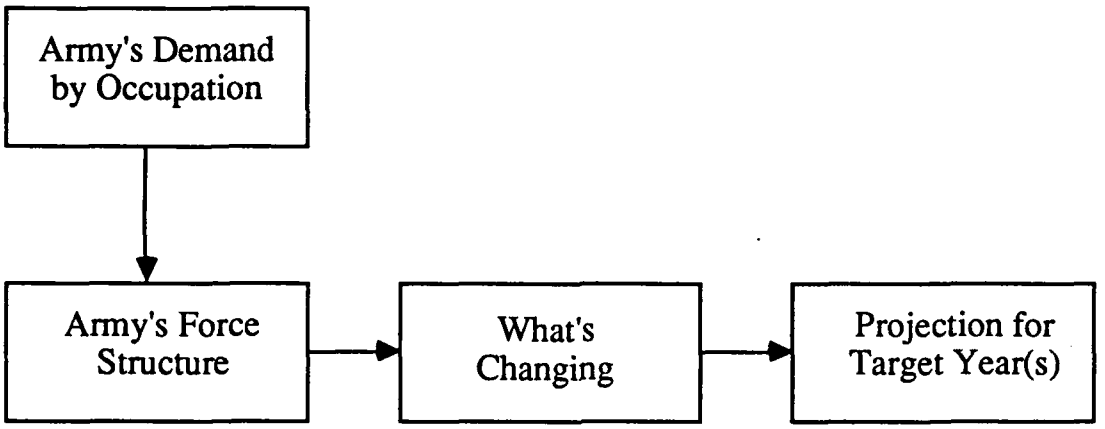
The box just above "Army Force Structure" is labeled "Army's Demand by Occupation." The arrow joining the two indicates that the factors generating Army demand also generate or determine the Army's Force Structure. Two separate boxes are drawn to indicate that the current force structure may itself contain gaps between Army demand for civilian personnel and the actual levels of these personnel. Due to adjustment problems or lags, there may be too many or not enough civilian personnel in some categories.

The problem of forecasting demand involves developing projections of demand by occupation for targeted future years. This task is represented in Exhibit 4-21 by the rightmost box. One may want these occupational forecasts disaggregated in a number of the ways listed below the box. These projections are obtained using the following two-step process. First, important underlying determinants of the Army demand that may be subject to change over the projection period are identified and analyzed to see whether any patterns of change can be anticipated. Second, for each determinant that can be anticipated, the possible effects of its change on the current force structure is analyzed, producing the desired projections of occupational demand in the target year. The first step, that of identifying determinants, is indicated in Exhibit 4-21 by the "What's Changing" box. Its placement connecting the Army Force Structure and Projection boxes indicates that it accounts for the movement from current force structure by occupation to projected force structure by occupation.

Exhibit 4-21 also lists factors that are expected to affect the Army's civilian occupational mix. We discuss several of these factors, indicating the kinds of forecasting techniques likely to be useful in estimating their impacts on the occupational distribution.

Exhibit 4-21.

Projecting The Army's Civilian Personnel Requirements



Actual distribution for CIVFORS occupation groups:
- by command
- by region
- by grade/payplan
- by career program

Occupation by:
- MACOMs
- Region
- Grade/Payplan
- Career Program
- Total Army Civilian Workforce

What's Changing:

1. Mission Mix of the Army.
   - Shift in importance by MACOM specified in dollars or people.

2. Change in Staffing Ratios by MACOM.
   - due to change in doctrine
   - due to technology.

3. Change in Budget for Army and by MACOM.

4. Changes Predicted by Historical Extrapolation.

Shifts in the Mission of the Army Affecting the Relative Size of Different MACOMs. Army planning for future military personnel needs is based in part on views about the mission of the military and how it is likely to change. Just as planning for military personnel is based on Army mission, so too should civilian personnel planning.

Let us assume that these views or plans can be obtained by those doing the projections of the demand for civilian personnel, and that their implications for the relative importance of the MACOMs in budget or total personnel terms are known. Then the following methodology can be employed to produce projections of demand for civilian personnel.

This very straightforward approach requires two ingredients. First, we obtain from CIVFORS the current occupational distribution of civilian personnel by command. This information is then expressed in the following form: the percentage of civilian employees in command A in occupation 1, the percentage in occupation 2, etc. This procedure is carried out for the entire list of occupations for each command. It yields a table or matrix which shows, for each command, the percentage of its civilian employees in each occupation. The second ingredient required is a forecast of the changes in relative importance of various commands expressed in terms of civilian employment. That is, one must provide a forecast indicating how the total civilian personnel allotted to each command is going to change. If instead, the Army plans specify how the relative importance of various commands are going to change in terms of budgets, or in terms of military personnel, a way must be found to translate these forecasts into total civilian personnel changes by command.

Once these two ingredients are provided, it is a very simple numerical exercise to "forecast" how the Army civilian personnel occupational mix changes as the relative importance of different commands changes in terms of relative civilian employment. Thus, given an external forecast of the rate of growth in civilian employment of different commands (based on forecasts of changes in the Army's "mission") the overall change in civilian occupational mix can be estimated.

Change in Staffing Ratios by MACOM. The projections described in the previous section were based on an assumption that "staffing ratios" or "occupational mix" within each MACOM did not change. However, there are several factors that might lead to changes in staffing ratios within a MACOM. Two potentially important ones are changes in military doctrine which affect occupational requirements and changes in "civilian" technology which lead to changes in the way occupational tasks are carried

out. An example of a doctrine change which might lead to a change in occupational requirements, i.e. "staffing ratios," would be a decision to use more laser-based weaponry for combat commands. This might alter those commands' needs for civilian personnel capable of repairing this particular kind of specialized equipment. An example of a change in "civilian" technology would be the growing use of computers to take over clerical and accounting tasks in the civilian economy; this change in methods of doing accounting and clerical work would be likely to filter into the Army procedure for performing accounting and clerical tasks. This in turn would affect the number and kind of accounting, clerical and computer personnel needed by particular commands.

Consider first the example of a projected change in doctrine. Two ingredients are needed to turn a projected doctrine change into a projection of changes in force structure by occupation. First, a precise forecast of the doctrine change itself, including its time path is required. Presumably such a forecast would be produced by those Army planners responsible for defining doctrine, and would be the same forecast used to plan military force structure. Second, a way to translate the doctrine forecast into a staffing needs forecast is required. This is not currently performed but COF planners could generate new staffing ratios based on a new force structure. Once the staffing needs forecast was done, it is once again a simple matter to impose the new staffing mix and calculate overall occupational requirements for a given budget size.

For the second example, changes in technology in "civilian" jobs, the issue is how to identify such changes in the civilian economy, and how to project whether such changes will be carried over into the Army's use of civilian personnel. Our discussion in Chapter 2 on forecasting the effects of computerization on (non-Army) occupational needs for clerical personnel suggests that these changes are extremely difficult to forecast. An approach worth exploring using the CIVFORS/DMDC and BLS data on historical staffing ratios is to examine whether changes in staffing ratios in the Army have followed in any systematic way changes in staffing ratios in sectors of the civilian economy. If there appears to be a historical relationship in which Army civilian staffing follows staffing ratio changes in other industries, then current changes in these "leading" industries might be used to help forecast civilian staffing ratio changes in the Army.

Change in Budget by MACOM. The third item listed in Exhibit 4-21 is changes in budgets. An overall budget change which was expected to be distributed to each command in proportion to that command's current budget would be expected (in the absence of an accompanying change in

mission) to leave unchanged the civilian occupational distribution; only the absolute numbers of personnel in each occupation would be expected to change. The natural assumption would be that of a 5% budget rise (fall) would result in a proportionate rise (fall) in the desired number of personnel in all occupations.

Consider instead a budget change which was expected to give different percentage increases or decreases to different commands. If it can be assumed that these budget changes translate directly into a proportionate employment change, then the method described above for calculating the effects of "Shifts in the Mission of the Army" can also be used here to show the overall change in Army civilian personnel mix.

Changes Predicted by Historical Extrapolation. An additional approach to predicting changes in occupational mix is to examine trends in the historical baseline data. One would observe the percentage distribution of occupations in each year from the mid-1970's (the earliest period for which systematic data by occupation is available) through a recent year, and look for any occupations which exhibited substantial and continuing growth or decline in relative importance. This procedure of working from actual patterns of recent experience has the advantage that it may help identify sources of change that the analyst might have otherwise been unaware of.

Once occupations exhibiting substantial change were identified, two different predictive strategies might be pursued. The forecaster could take a somewhat technical approach and project the trend into the future. For example, if an occupation had been growing 1% a year, the forecaster might project a continued growth rate of 1%. However, this straightforward approach is subject to serious criticism. A past growth trend is no guarantee of a continuation of the same trend; one needs to try to understand the forces determining the trend in order to have a better idea of how likely the trend is to continue. There is also the more mechanical difficulty that in many cases the trend line can be extended in several different ways (as a straight line, an exponential curve, a logistic curve, etc.) producing considerable variation in the forecast. The choice among such alternative extensions should not be made in any simple mechanical way.

In the face of these difficulties, a second, less mechanical, and more analytical approach should be considered. Once a trend in the data was located, the forecaster would analyze the trend to see whether the underlying causes of the trend could be identified. To the extent that such

causes could be identified, they would help the forecaster in determining how likely it was that the trend would continue, fade, or accelerate. Note, however, that it is impossible to know in advance how likely it is that such underlying factors could in fact be identified in specific cases. Thus, whereas a trend can always be mechanically projected into the future, there is no similar guarantee that the factors underlying a trend can be identified.

Identifying Availability of Employees by Occupation

Once demand forecasts by occupation are available, it is necessary to identify those occupations which may present problems in generating enough supply to meet the forecasted demand. One way to achieve this objective would be to specify a separate supply model for each of the occupations whose demand had been forecast. This would be a massive undertaking, conceivably involving upwards of 200 occupations and therefore upwards of 200 separate supply models. Such a project would be extremely expensive. An even more compelling argument against this "brute force" approach is that constructing individual occupation supply models that consistently achieve acceptable levels of accuracy is beyond current modeling and forecasting capabilities. Thus, a massive, very expensive effort of explicit supply modeling is likely to produce unacceptable results.

If accurate full-blown modeling of each of 200+ occupations were possible, it would no doubt reveal that a very large percentage of the 200+ occupations would not present supply problems. Is there then, some "short-cut" diagnostic system allowing a forecaster to identify or "flag" potential supply-problem occupations without doing full-blown supply modeling for all occupations?

A particular diagnostic approach seems promising. This approach involves anticipating kinds of situations likely to generate the potential for supply problems, and then identifying the subset of occupations fitting these anticipated situations. To see how this approach might be applied, consider a simple example. One kind of situation likely to generate supply problems would be occupations for which the Army's pay was far below civilian sector pay. Identifying the subset of occupations fitting this situation would involve investigating Army versus civilian sector pay levels for each Army civilian occupation. This is a far less demanding task than trying to model the full supply situation for all occupations.

A crucial part of successfully applying this diagnostic technique is how well one does at specifying "kinds" of situations likely to produce supply

problems. A list of such situations is given below, but an optimistic introductory remark is in order. If one or more Army analysts become responsible for conducting these forecasting projects, and carry out a series of forecasts over a period of time, they are likely to learn as they gain experience in doing forecasts what kind of additional situations which are not yet identified may generate supply problems. Thus, this aspect of forecasting is likely to be subject to a very beneficial learning curve.

Types of situations likely to generate supply problems. We have identified a number of situations that might lead to supply problems. We reiterate that, since this is a first attempt at this kind of approach, experience with actual forecasts of Army civilian employment by occupation is likely to result in additions to and sharpening of the categories included in the list. First the categories are presented and then data availability for empirically implementing each category is discussed. Our five categories are:

1. Occupations for which Army compensation is not competitive with the civilian sector.

2. Army occupations held by civilians which are highly skilled and for which the Army represents a large percentage of total civilian employment.

3. Occupations expected to be in growing demand in the economy as a whole and in the Army, but supply growth in those occupations is expected (at least temporarily) to lag behind growth in demand.

4. Occupations in which the Army is predicted to have a rapidly growing demand, but for which the rest of the economy does not have a rapidly growing demand.

5. Occupations for which the Army has a growing demand even though the demand for the occupation in the economy as a whole is shrinking. This can be viewed as a special case of (4).

A few comments about these categories are in order before considering the empirical problem of identifying which specific occupations might fit particular categories. In particular, some explanation may be needed as to why each situation described might lead to supply problems. The argument for category 1 seems clear; if the Army pays a considerably below-market wage for a particular civilian occupation, it is likely to have difficulty attracting enough applicants of acceptable quality. Category 2 describes a

situation in which the Army is a relatively large employer. In that situation, if the Army's demand is increasing, it cannot expect to lure very large numbers of trained employees away from other employers, since (by assumption) there are not large numbers of such employees at other employers. Thus, a growing Army demand can only be filled by initiatives that operate to increase the number of individuals being trained for this occupation.

Category 3 describes a situation likely to produce (at least temporary) labor shortages in the civilian economy as a whole. In this situation the Army is "sharing" in a shortage that is affecting all employers. Categories 4 and 5 describe situations in which the Army's demand for an occupation is growing, while demand elsewhere is stable or shrinking. This can result in a supply problem for the Army if two conditions are fulfilled: (1) the stability or decline in demand elsewhere results in too few new employees choosing to enter this occupation: and (2) the Army is unable to meet its growing demand by hiring already-trained people who are losing or leaving jobs at other employers.

Two further comments on these categories are in order. First, the categories identify situations that **may** generate supply problems; even if an occupation situation fitting a category is identified, it may not in that specific instance generate an actual supply problem. For example, a category 5 situation need not always produce a supply problem; it might be the case that other firms were laying off trained people fast enough to allow the Army to more than meet its occupational supply needs. Second, Categories 3, 4 and 5 only apply to occupations whose skill requirements are distinctive enough that people in other fields cannot easily step in to do the job.

Identifying which occupations fit particular categories. How can occupations be evaluated to see if they fit one of the five categories just identified? Category 1 contains occupations for which the Army's pay and other components of compensation is not competitive with the rest of the civilian employment sector. To see if an occupation fits in this category, estimates of Army civilian compensation and of compensation elsewhere in the civilian sector are needed. Data for occupational pay within the Army are obtainable from CIVFORS. Data for compensation elsewhere in the civilian employment sector will have to be developed from BLS databases.

Category 2 contains high skill occupations in which the Army represents a large percentage of total civilian employment. Identifying such occupations requires comparing Army employment with civilian

employment in general. Data on Army employment by occupation is obtainable from CIVFORS/DMDC. Data on employment by occupation can be obtained from BLS and the Census Bureau. Careful attention will need to be paid to the problem of differing occupational classification schemes used by BLS, Census, and the Army. This will require use of appropriate crosswalks between the various schemes.

Category 3 contains occupations that are expected to be in growing demand in the economy as a whole and in the Army, but supply growth in that occupation is expected (at least temporarily) to lag behind growth in demand. The Army demand forecasts will identify occupations expected to be in growing demand in the Army. BLS occupational projections identify occupations expected to be in growing demand in the civilian employment sector. Once a list of occupations in growing demand both in the Army and in the civilian sector generally is identified, additional analyses will have to be provided to investigate whether supply lags might reasonably be expected. Such analyses are not currently generally available. Categories 4 and 5 require the same comparison of Army demand forecasts and civilian demand forecasts needed for Category 3.

Current CIVFORS Model

The CIVFORS model (see Exhibit 4-22) consists of several separate software modules. These are:

- Data Base Management (DBM) — This module extracts personnel data from CIVPERINS-I for use by the other modules. It creates a database with a time-series of personnel strength and transactions over various dimensions used in the projection process and over dimensions of interest to Army analysts.

- Rate Development (RD) — This module develops forecasts of transaction rates and factors for use by the other modules. It also develops projections of accessions for the military funded employees in temporary positions and civil funded employees in both permanent and temporary positions.

- Initial Inventory Projections (IIP), Stage I — This module projects the future strength and transactions from the current personnel inventory and separately for new hires. This module develops projections at the MACOM/PATCO/grade group level of detail. The projection horizon is currently at the end of the FYDP.

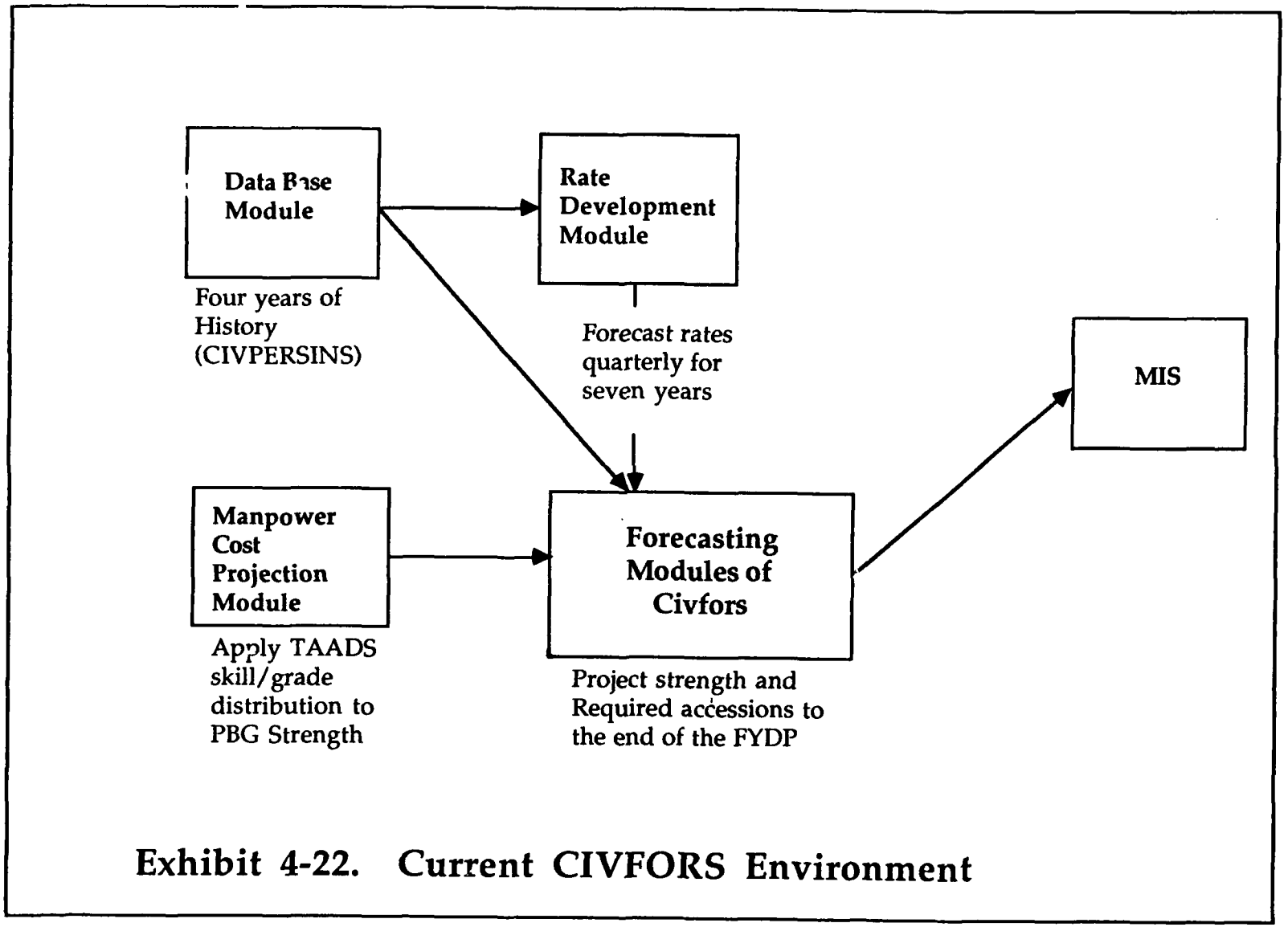


Exhibit 4-22. Current CIVFORS Environment

- Manpower/Cost Projection (MCP) — This module determines the force structure for the current year, budget year, and FYDP utilizing skill level data from TAADS and budget-approved strength data from MADIMS.

- Goal Optimization (GO) — This module determines the number of future new hires that best satisfy end-strength targets and workyear, limits from the MCP based on projected inventory from the IIP, and user specified bounds on accessions and end-strength. Accessions are determined only for military funded permanent position employees.

- Initial Inventory Projection (IIP), Stage II — This module projects the future strength and transactions that result from the combination of the current personnel inventory and the future new hires determined through the GO.

- Final Inventory Projection — This module distributes new hires determined in the GO to a more disaggregate level of detail than the IIP (i.e. MACOM/series/grade/payplan). It also projects end-strength and transactions at this level of detail. The distribution of new hires is done to best achieve the skill level end-strength targets determined by the MCP.

- Post Processor — This module distributes the skill level transactions produced by the FIP to the most detailed level. These detailed transactions are then used to predict the end-strength at the same level of detail.

- User Controls — These allow the user to specify policy scenarios to control the projection process. In particular, the user may modify the rates projected by the RD, the accession controls used by the GO, and the force structure developed by the MCP.

- Management Information System (MIS) — This is an on-line module which utilizes a series of user-friendly screens to generate graphical or tabular output reports. Most of the historical and projected data are available on the MIS.

- Report Writer (RW) — This module allows the user to format and specify hardcopy reports for his/her own use. All historical and projected data are available through the RW.

Enhanced Modeling Requirements

The current formulation of CIVFORS will support all of the COF and workforce demand requirements described earlier for a seven year horizon. These were an integral part of the functional requirements for which CIVFORS was designed, developed, and tested. CIVFORS has been formally accepted by the Army as satisfying these functional requirements. In order to enhance the capabilities of CIVFORS to support the additional functions described above, the following modeling features will need to be developed:

- Provide projections of national employment requirements by occupation. This feature involves the development of a National Employment Use module which would run independently of the current CIVFORS modules. It would use as its primary data source the occupational projections of the Office of Economic Growth in the BLS. Since the projections are developed for just one year in the future (currently the year 2000), this module will fill in occupational projections for the years between the last historical data year and the end of the current FYDP. This module should utilize current CIVFORS projection techniques to perform this task. The module will also contain the software to crosswalk the BLS data categories to the CIVFORS occupational classification system.

- Augment the current CIVFORS database with DMDC data. This will involve creating transaction behavior from the monthly snapshots of the civilian workforce by comparing individual personnel records for successive months. Since CIVFORS has data from December 1983, the required data should cover the time period 78-10 to 83-11. The inclusion of DMDC data will provide greater reliability in performing trend analysis in CIVFORS.

- Provide the capability for CIVFORS to project beyond the end of the FYDP. This will require: (1) changes to the RD to project annual rates in addition to quarterly; (2) changes to the IIP, GO, FIP, PP to project annually in addition to quarterly; (3) changes to the MCP to project the force structure beyond the FYDP; and (4) modifications to the RW, MIS, and User Controls to process data from the end of the FYDP for any additional years.

- Develop an on-line MIS capability using user-friendly screens to display for analysis and comparison of the projected demand data from the

CIVFORS model and the projected national labor requirements from the National Employment Use module.

Development Alternatives

This section presents five development alternatives for implementing the enhancements outlined above. These are based on ease of implementation and a "most bang for the buck" assessment of the capabilities. A recommendation will then be made based on these factors and on technical and hardware implementation feasibility.

Alternative 1. Augment the current CIVFORS model with additional data from DMDC and integrate into CIVFORS the identification of occupational supply problems,i.e., BLS projections and comparison to the Army requirements. This is by far the cheapest and quickest alternative, simply because no enhancements are made to the current model. It will require little additional computer storage space for BLS data.

Alternative 2. In addition to the capabilities provided in Alternative 1, enhance the CIVFORS model to project 12-14 annual periods. This alternative will require the least amount of changes to the existing software. The modules most affected will be the MCP, RD, RW, and MIS. The MCP will need to generate the force structure beyond the FYDP, the RD will need to generate annually instead of quarterly, and the RW and MIS will have all new reporting requirements. This alternative will require additional storage for the additional CIVFORS projections. The additional capabilities are shown in Exhibit 4-23.

Alternative 3. In addition to the capabilities described in Alternative 1, enhance the CIVFORS model to project 30 years in 5-year snapshots at an aggregate level of detail. This alternative reaches the 30 year horizon but there is no source for national employment data to compare to Army demand past year 2000.

Alternative 4. In addition to Alternative 1, enhance CIVFORS to project annually for 30 years at any aggregate level of detail. This is essentially a new, parallel system which could use some of the existing data structures and software. This alternative would require more disk space than Alternative 2 or 3 and have the same limitation as Alternative 3 on national employment data.

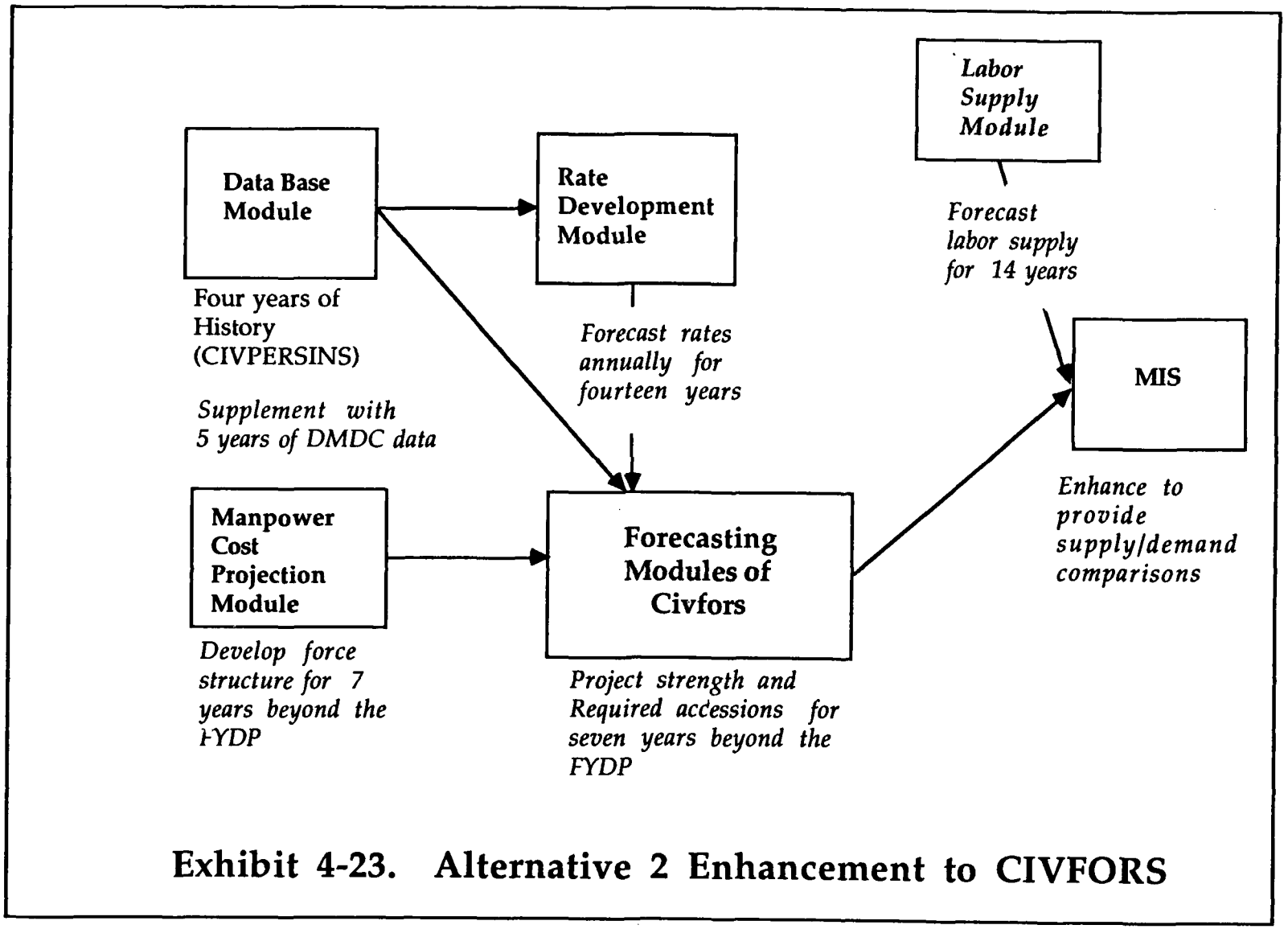


Exhibit 4-23. Alternative 2 Enhancement to CIVFORS

Alternative 5. This is similar to Alternative 4 but at the level of detail of the current CIVFORS system. In addition to being a new, parallel system, there are hardware, storage, and CPM constraints to be analyzed. It may be technically infeasible to implement this alternative.

We recommend that the implementation process take a phased approach. Alternative 1 should be implemented for obvious policy analysis benefits through the end of the FYDP. The additional capabilities of Alternative 2 should be implemented next in order to bring demand projections in alignment with the BLS projection horizon. This represents a major change in the way in which several CIVFORS modules handle data. Since the use of quarterly data to develop projection equations captures short-term fluctuations, the standard practice concerning projections of this length (up to 14 years) is to use annual data. Thus, CIVFORS will need to be augmented to perform projections on an annual basis in addition to its current quarterly capabilities.

Alternative 2 will also require: 1) the definition (projection) of a civilian labor force structure for seven years beyond the end of the FYDP, 2) modifying the National Employment Use module to fill in all intervening years, and 3) changes to the CIVFORS MIS. With the results of Alternative 1 already in place, these changes are envisioned to be relatively straightforward. It is the extensions to CIVFORS which represent a significant effort.

Our research indicates that any effort to project beyond 14 years or to further disaggregate the data, involves: 1) the introduction of so much additional uncertainty as to render the resulting forecasts unreliable; or 2) changes to the CIVFORS system which would be prohibitively costly and would encounter current computer hardware constraints.

On the first point, the U.S. Department of Labor has devoted significant resources to producing national projections through the Office of Economic Growth and Employment Projections. In our opinion, that office provides the best set of occupational projections currently available. Without generating a parallel effort, any attempt to develop, implement, and maintain a similar model would produce an inferior product. If BLS projections are to be used, however, then one is "limited" to a projection horizon of 12 to 14 years (the current projection is for the year 2000).

It is our strong recommendation that resources devoted to Army civilian forecasting should go to Alternatives 1 and 2 as described above. Although projections for a thirty year horizon could be produced at

substantial cost, their reliability or usefulness for personnel planning would be minimal. The recommended modeling methodology will well support the Army forecasting needs identified in this study.

CHAPTER 5. IMPACT OF FUTURE TRENDS ON THE RECRUITMENT OF CIVILIANS

The main thrust of this report has been the specification of modeling requirements to forecast Army civilian employment levels and recruitment needs. However, the research of future issues and trends highlights several policy areas which will impact the ability of the Army to recruit civilians in the future. The interview process and literature review identified policy areas applicable to any future employer, as well as some Army-specific areas. This section discusses the following issue areas as they apply to the future recruitment of Army civilians:

(1) Internal adjustments due to future policy decisions about Army personnel structure

(2) Adjustments due to changes in compensation levels

(3) Effects due to changes in technology

(4) Adjustments required by budget changes

(5) Changes in the national labor force

(1) Internal adjustments due to future policy decisions about Army personnel structure.

There are several action items which would improve the Army's ability to perform civilian planning functions. The first step would be to clearly define the role of civilians within the total Army, both in peacetime and during mobilization. Vagueness about how civilians support the Army mission tends to put civilians in a reactive mode rather than one of considered design. A clear definition of the role of civilians is an essential component of the Army Plan. The role of the civilian is likely to change along the following directions:

- an increase in managerial responsibilities
- an increase in indirect combat support (para-professional)
- an increase in high-tech areas (technicians)

Having defined the role of the civilian, the civilian force requirements should then be described quantitatively and qualitatively in terms of a

Civilian Objective Force. Knowledge of the numbers of civilians required with associated skill and grade levels is essential if accurate planning is to be accomplished. It would then be possible to incorporate civilian force requirements with military force requirements for both long and short range planning and management purposes.

In order to achieve the Civilian Objective Force, a Civilian Force Management Plan would need to be developed and maintained. This plan would enable the Directorate of Civilian Personnel to recruit, train, and manage current and future employees to meet the Civilian Objective Force requirements.

Although this approach sounds straightforward, it is clear that there would be many procedural and political obstacles to overcome in order to fully implement these changes. No one wants to change the decentralized approach to hiring and managing civilians. However, having a well-defined role for the civilian in terms of the Army mission should enable local commanders to make their requests for civilians in the context of a Civilian Objective Force. The use of a Civilian Force Management Plan should help local commanders in their planning and would be a tool for implementing programs which would ultimately help them.

In order to provide the information needed to develop and manage the civilian force as described, the Civilian Forecasting System (CIVFORS) should be enhanced to incorporate comparisons of Army demand for employees with BLS projections of the national employment. This enhanced system will then be able to support both the short and longer range planning needs.

Having this civilian force information would help decision-makers with two kinds of policy decisions about Army structure that would affect the need for civilian personnel: decisions to shift military personnel out of TDA positions into TOE positions, and decisions to rely more on contracting-out to meet TDA type staffing responsibilities.

What effects would shifting military personnel out of TDA positions have on civilian recruiting and staffing requirements? The answer would seem to depend on two critical determinants: 1) the occupation/skill characteristics of the TDA jobs currently being performed and likely to be vacated by the military, and 2) the extent to which the number of civilian slots is likely to rise in response to the need to take over these tasks formerly performed by military personnel.

If the number of slots is expected to rise by the full number vacated by the military, the occupational mix of new civilians needed is unproblematical; civilian replacements need to be in the same occupations as the military personnel being replaced. If a smaller number of new civilian slots is expected, then one needs to decide which of the occupational slots formerly filled by military personnel will be abandoned. In principle this decision should depend upon the relative importance of different occupational personnel in carrying out essential TDA tasks.

A second kind of restructuring generating civilian personnel adjustments involves a greater reliance on private contractors to meet TDA type staffing responsibilities. Such increased reliance on contractors might be mandated by Congressional directives, general Defense Department policy directives, or be caused by budget restrictions placed on the number of civilian personnel slots.

Regardless of the source of the contracting-out incentive, it seems plausible that much of the contracting-out would take place in relatively lower-skilled activities, so that contracting-out might be expected to raise the average skill level of the civilian personnel occupational mix. Thus, except in the more unlikely case that the contracting-out did involve some relatively skilled activities, it would be unlikely to ameliorate any problems in recruiting skilled civilian labor the Army already had. It would be useful to examine past contracting-out patterns to see whether they had in fact been concentrated in relatively lower-skill activities.

(2) Adjustments due to changes in compensation levels.

Compensation is a key factor in the competition of employers for a shrinking pool of qualified workers. The Army must identify compensation and benefits packages which will enable them to attract and retain skilled civilians. Workers will most likely be looking for jobs offering:

- better pay (including regionalized adjustments)
- cafeteria-style benefits selection

There are several reasons for expecting that the level of Army civilian compensation may lead to situations requiring personnel policy adjustments. First, studies of pay comparability between the Federal government and the private sector suggest widening differentials in favor

of the private sector.[11] Second, even if government pay was on average comparable to private sector pay across occupations, there would be regional disparities. Federal GS pay levels are set nationally, but wages in the private sector in some regions will be above national averages, leading to wages on federal employment being relatively low in these areas. Third, the federal employee retirement system has been changed in a way that makes pensions more "portable." This can be expected to increase turnover rates among Army civilian personnel, increasing the amount of recruiting and hiring required to keep the same number of jobs filled. While relatively few long-service employees have switched to this new retirement system, all new employees hired since 1985 are automatically in the new system. As these newer employees become a larger percentage of the Army civilian workforce, one can expect to observe gradually increasing turnover rates. One could get a more precise picture of the expected timing of this increase in turnover rates by examining data on the age distribution of the Army civilian workforce hired prior to 1985.

Some additional comment is necessary on the first two problems mentioned, the growing disparity on average between federal and private sector pay, and the problem of high-wage areas. Remedying these problems would seem to require a government-wide solution. In the absence of such a solution, two strategies which might help ameliorate the situation could be pursued by the Army.

The Army should try to obtain special dispensation to go above the federal scale in geographical areas where the Army faced demonstrable continuing shortages. Allowing the Army special dispensation would seem to be to a first step towards altering the entire system of pay determination. That is, special exemption seems tantamount to a government-wide change in the entire system, a change allowing for regional disparities. One implication of this analysis is that the Army may want to explore the desirability of combining forces with other agencies to press for a change in the federal salary determination system towards greater flexibility in allowing for regional differences in civilian pay levels.

A second strategy the Army might pursue is to move activities to low-

[11] "National Survey of Professional, Administrative, Technical, and Clerical Pay: Private Sector Industries, March 1987", Bureau of Labor Statistics, U.S. Department of Labor, Bulletin 2290.

wage high-unemployment areas where the federal pay disparity was less pronounced, and (due to high local area unemployment) had less of a deleterious effect on Army recruiting of civilians. However, the status of areas changes over time; areas that were high unemployment and low wage sometimes "recover" and experience booms. There is no guarantee that a geographical area picked because it seems to allow easy recruiting will remain an easy-recruiting area over relevant time horizons.

(3) Effects due to changes in technology.

The proliferation of advanced technologies and the continued integration of computers into the workplace will cause changes in tasks performed and skills required to do the work. There are at least two possible effects due to changes in technology that deserve attention. First, do changes in technology mean that educational requirements for civilian personnel are increasing? Second, how might we expect changes in technology to affect staffing ratios?

One might follow Charles Taylor's analysis of education requirements for military personnel in recognizing the possibility that educational requirements might grow. Taylor points out that educational requirements are likely to be high if the soldier in year 2010 is to be "fully capable of comprehending and operating automated, robotic, and computerized systems and highly competent to participate in multilingual computer and video conferencing networks...and to teach and train others in the use of specialized military oriented high-tech equipment and weapons." However, even if one accepts Taylor's prediction as plausible for military personnel, one needs to be cautious about its direct applicability to civilian personnel. Civilian personnel are hired for specific jobs; these jobs often do not have the wide range of responsibilities that the Taylor quote assigns to military personnel.

Moreover, technological progress can result in less stringent educational-skill requirements for particular jobs instead of more stringent ones. For example, with the advent of the computer, some specialized tasks that once required experts to perform can be embodied in a computer program, allowing an individual without the same amount of specialized training to perform the task by following the instructions that the computer program indicates to the program user.

What is clear, however, is that workers will be doing things differently. This then implies that the Army must improve the education and skills of all workers in order to remain competitive and accomplish its mission.

The economy will be demanding more flexibility and dynamism at the same time the workforce is aging and becoming less willing to relocate and change occupations. The investment in training of all types will enhance the Army's ability to maintain the quality and usefulness of its workforce.

Our second question concerned the effect of technological change on staffing ratios. It may seem as though technological change would result in staffing ratio shifts toward more technical occupations, but as indicated in the preceding discussion, technological change may actually decrease the skill requirements associated with some tasks. This could result in less-skilled occupations being substituted for more-skilled occupations.

Some of the adjustment to more complex technology may take place with no change in job titles or staffing ratios. Consider, for example, the replacement of a less technologically sophisticated battlefield weapons system with a much more sophisticated system. Both systems require specialized maintenance personnel, some of whom are civilians. The civilian maintenance personnel for the new weapons system may have exactly the same occupational titles as the older system's maintenance personnel, so no difference in job titles accompanies the technological change in weapons systems and job responsibilities. Furthermore, the number of individuals required to maintain the new system may be larger, smaller, or the same as the number needed to maintain the old one; there is no general prediction that the number of maintenance personnel must necessarily rise or fall.

A third reason why one cannot easily anticipate the effects of technological change on staffing ratios is illustrated by the case of the effects of computers on clerical personnel discussed in Chapter 2. While many observers expected a large decline in the use of clerical workers with the advent of computers, this large decline has not materialized as some of these observers expected. As indicated in the discussion of Hunt and Hunt's analysis, one important reason that a much larger decline has failed to materialize involves the demand for computer-related services. Because computers make it easier ("cheaper") to perform all kinds of clerical and statistical tasks, employers now ask for much larger volumes of this kind of material. Thus, the advent of computer has led to an increase in the volume of clerical tasks demanded. This rise in volume offsets the decrease in demand for clerical personnel due to the fact that individual tasks can be done much faster.

All this uncertainty about the possible effects of technological change on staffing ratios seems to imply that, in the absence of strong additional

evidence about particular effects from specific technological developments, a sensible attitude would be to avoid strong predictions of large changes in staffing needs.

(4) Adjustments required by budget changes.

In the face of large and continuing federal deficits, it seems plausible to expect that future administrations will need to cut defense expenditures in real terms. This eventuality suggests a scenario in which the Army's budget decreases in real terms. How is such a budget decrease likely to affect the Army's demand for civilian personnel by occupation? We established in our discussion of baseline data that different commands have different civilian occupational staffing ratios. Thus, how a budget decrease affects the Army's demand for civilian personnel by occupation depends on how the budget decrease is "shared" by the various commands. If budgets by command are likely to be cut by equal proportion, then it is plausible to expect occupational mix for the Army as a whole not to change. If, on the other hand, one has a specific expectation that Command X will be cut 20% more than Command Y, one can use existing staffing ratios for each Command (available as baseline data) to derive the exact implications of this differential budget cut by Command on the resulting overall Army staffing ratios.

(5) Changes in the national labor force.

Recent U.S. Government projections of the labor force suggest a number of important changes between now and the year 2000:

(1) Labor force growth is expected to be much slower between now and 2000 than it was between the early 1970's and today. This expected labor force slowdown reflects the slowdown in population growth.

(2) Younger workers will become a smaller share of the labor force because the population of their age group is declining. The percentage of workers ages 25-54 will continue to increase, reflecting in part the aging of the baby boom generation. The percentage of workers age 55 and over may decline even though their weight in the population continues to rise because of possible continuing declines in the labor force participation rates.

(3) The share of the labor force consisting of women, blacks, Hispanics, and other minorities is expected to be substantially higher in the year 2000 than it is now.

(4) Immigrants will represent the largest share of the increase in the population and the workforce since the First World War.

The question for this report is how these and other predicted sizable demographic changes in the labor force are likely to impact upon the Army's occupational demand and supply situation. The answer is that impacts of these large demographic changes on the Army's occupational situation will be very indirect. There is essentially no strong direct predictable link between a larger labor force or a larger percentage of women in the labor force and the Army's demand for and ability to recruit civilians. The causal link running from more women in the labor force to the total supply of engineers or plumbers, to the net supply of plumbers or engineers to the Army, includes so many complex relationships that it is meaningless and foolhardy to predict a simple connection.

What these demographic changes do mean, however, is that in order to recruit and retain qualified workers from this new labor pool, the Army will have to:

- Provide the flexibility in the work schedule to respond to the needs of working parents: flexible hours, use of sick leave for dependents, part-time work, and maternity and paternity leave.

- Provide high quality day care. This alone could solve some of the clerical turnover problems experienced in some large urban areas.

- Provide "second chance" educational systems to bring disadvantaged workers up to basic English, reading, writing, and math skills.

Conclusion

The Army will have to respond to the needs of the changing workforce if it is to attract and retain an adequate supply of qualified workers. There will continue to be a body of research, both public and private, to advise employers of the "best" ways to do this. However, the methodology for matching future Army civilian needs with the national employment requirements will depend on well-defined estimates of the Army's demand for workers. In order to produce this information, the Army will need to define the role of the civilian, now and in the future, and implement policies and procedures which support the civilian as an integral part of the Total Army.

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Appendix A

Other Planning/Forecasting Methods

1. Annualized Cost of Living (ACOL)

   This model was developed by Systems Research and Applications Corporation (SRA) for the Army Research Institute. It is used for military retirement analysis.

2. ARI Enlistment Forecasting Model

   The ARI enlistment forecasting model is designed to provide forecasts of the number of high quality male enlistment contracts for the next year. High quality is defined as high school graduates who score at or above the 50th percentile on the Armed Forces Qualification Test (AFQT). Since high school seniors can sign an enlistment contract to access sometime after graduation, the Army includes them in defining the prime quality market as Graduate-Senior males in test score categories I-IIIA (GSMA).

   The high quality market is of particular interest because high school graduation status and AFQT scores have proven reliable indicators of trainability and adaptability to service life.

3. Base Operations Support Manpower Model (BOSMM)

   USAMARDA has begun the analysis for development of the BOSMM. It is intended to assist in projecting changes in base operations requirements due to changes in MTOE and movement of activities, e.g., battalions.

Appendix B

Percent Turnover and Percent Fill by MACOM

Delivered to COR Only

Appendix C

Staffing Ratios by Occupation Series

Delivered to COR Only

Appendix D

INTERVIEW SUMMARY

As part of the data gathering process, interviews were conducted with individuals who, by the nature of their work experience or professional expertise, could provide some insight into the questions addressed by this study. The topics addressed in the interviews were: the Army planning process as it relates to civilians, forecasting efforts and methodology which might be applicable to long-range planning for Army civilians, and future issues and trends.

Having identified the interview topics, the study team developed a list of individuals, both inside and outside the Department of the Army, who were likely to provide useful information in these areas. Those who worked for the Army were the first to be interviewed. It was essential to understand the planning process and to learn how the Army's need for civilians was identified. The Study Advisory Group reviewed the list of potential interviewees and advised the study team as to who should be seen. Of the 20 Army staff interviewed, 5 were associated with Army forecasting models. The remaining 15 operated in a functional area which had a role in Army civilian planning.

After assimilating the Army based information, the study team then determined which non-Army professionals would be in a position to provide additional information. The Project Advisor provided guidance as to which individuals or organizations had the required expertise. Four interviews were conducted with various individuals at the Bureau of Labor Statistics, a key source of information for labor force projection data. Three people from the Office of Personnel Management were interviewed, providing insight into future issues for personnel management of Federal civil servants. The other seven non-Army interviewees were labor economists, education specialists, and economic forecasters.

Each interview was focused on the functional responsibilities or area of expertise of the person being interviewed. The objectives of the study were introduced and the three main topics were described. The interviewee then responded with whatever information she or he deemed relevant. There were often suggestions of other people or documents that might provide additional information. The notes from these interviews were shared with the other study team members and it was determined what was of use for the project.

After the interviews were largely completed, the information gathered was utilized to develop a methodology for improving the civilian manpower planning process by incorporating the impacts of current and future trends.

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